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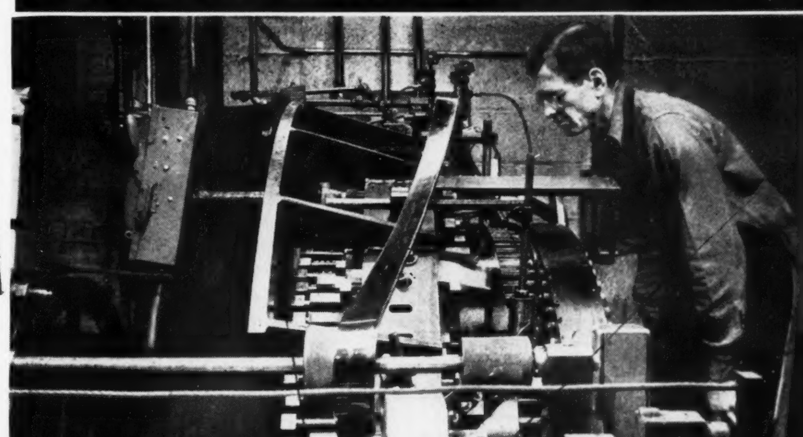

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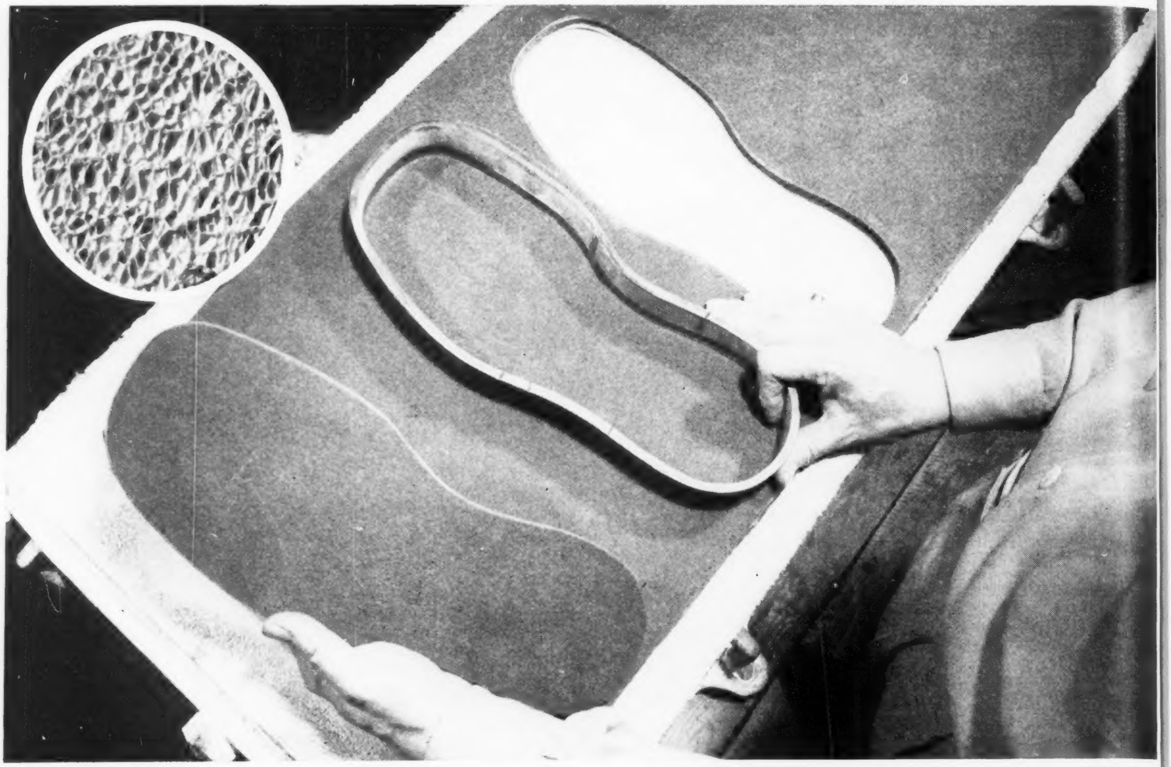

Uniform cell structure for quality cushion shoe soles...with Du Pont UNICEL ND

Whether it's a closed cell shoe sole or an open cell bathroom sponge, there's a dependable Du Pont blowing agent that will assure uniform cell structure in the elastomeric sponge you make.

UNICEL ND, 40% N, N-dinitrosopentamethylenetetramine . . . for open or closed cell sponge products.

UNICEL NDX, 80% N, N-dinitrosopentamethylenetetramine . . . where higher active ingredient content is desired in making open or closed cell sponge.

UNICEL S, a fine dispersion of sodium bicarbonate in light mineral oil . . . for open cell sponge products.

Each member of this family of Du Pont blowing agents disperses readily in all elastomers. Each is non-discoloring, non-blooming, non-toxic, possesses excellent storage stability and, in addition, is most economically attractive.

UNICEL ND and UNICEL NDX produce small, uniform cells in either open or closed cell sponge. Effective odor control can be obtained by the addition of 25% urea and 15-25% Aquarex NS based on the amount of blowing agent used.

UNICEL S, for open cell sponge, disperses quickly and decomposes much more rapidly and completely than ordinary sodium bicarbonate, permitting the use of smaller amounts of blowing agent. It produces odor-free sponge.

For more information about these Du Pont blowing agents, write for Report 56-3 or contact the district office nearest you.

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protect against scorching... assure uninterrupted production with Good-rite VULTROL

YOU can assure uninterrupted production by preparing in advance for scorching problems with a supply of Good-rite Vultrol. It requires no special handling. Good-rite Vultrol prevents scorching all year round by retarding cure at processing temperatures. It serves as a mild activator at curing temperatures. And in addition, use of Vultrol makes possible remarkable savings in recovery of scorched stock.

Good-rite Vultrol is beneficial in the processing of high-loaded or highly accelerated compounds, too. For tire tread compounds, it is particularly effective with high-abrasion furnace blacks.

Supplied as a free-flowing flake, Good-rite Vultrol is economical and easy to use. It saves you time, money and labor. For more information, write Dept. KB-7, B. F. Goodrich Chemical Company, 3135 Euclid Avenue, Cleveland 15, Ohio.

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VOLUME 138, NUMBER 4 JULY, 1958

CONTENTS

Cover Photo: Courtesy of The Ohio Rubber Co.

The opinions expressed by our contributors do not necessarily reflect those of our editors

FEATURE DEPARTMENTS

Which of these resins can help you make a better nitrile rubber compound?

To meet your needs for reinforcement of nitrile rubbers, Durez offers a wide choice of specially formulated phenolic resins.

Completely compatible with nitrile rubbers, these resins serve as thermosetting plasticizers. Upon melting at process temperatures, they soften and plasticize the stock.

Chemical reaction causes vulcanization of the rubber, with substantial gains in strength, hardness, stiffness, abrasion resistance, heat and chemical resistance of the final cured stock.

Compatibility and reactivity increase with increasing nitrile content.

In recipes employing 75 parts or less of resin on 100 parts of nitrile rubber, it is possible to reduce the amount of sulfur accelerators and reinforcing fillers normally used, because of the vulcanizing effect of the resin.

With higher resin content (100 parts or more), all sulfur and accelerators may be omitted. Fillers may be used to increase strength and reduce cost.

For use with nitrile-type copolymers, the following Durez resins are recommended:

12687 and 12707 powdered resins • Of these two resins, 12687 is considered the more generally useful and effective. The 12707 powdered resin is the same as 12687 except less reactive. It is useful in compounds that have a tendency to be scorchy. Stocks made with 12707 are lower in hardness and tensile strength and higher in elongation than stocks containing an equivalent amount of 12687.

12686 lump resin • This is the base resin from which 12687 is made. It is supplied in lump or crushed form. In crushed form, it is entirely thermoplastic and can be safely used in compounding where high temperatures are encountered, as in Banbury mixing. It requires addition of 8% hexamethylenetetramine during the last stage of Banbury mixing or on warm-up mill to make it properly thermosetting and give properties equivalent to 12687.

11504 resin • Supplied as a soft brittle resin, 11504 is useful in compounding stocks in the softer range –40-60 hardness. It requires addition of 8% hexamethylenetetramine to make it properly thermosetting.

13037 liquid resin • This is the same basic type of resin as 12686, but in heavy liquid resin form. It can be used with other resins to obtain further softening of the stock during compounding without strongly affecting other properties. Alone, it does not contribute as much hardness and reinforcement to nitrile rubber stocks as do 12687 or 11504 resins. It requires addition of 10% hexamethylenetetramine to make it properly thermosetting.

Where else can Durez resins help you get properties you want?

GRS and natural rubber compounds • As plasticizers, Durez resins impart hardness, stiffness, and abrasion resistance to compounded stocks of GRS and natural rubber. Hardness and stiffness are retained at high temperatures. Compatibility with GRS is improved by using some nitrile rubber in the recipe.

Solvent-type adhesives • Excellent adhesives can be produced using Durez resins with nitrile rubber, natural rubber, and Neoprene. Durez resins have been used successfully as an adhesive for bonding uncured and cured nitrile rubber stocks to various metals during molding.

Synthetic rubber latices • A highly effective means of hardening and reinforcing nitrile rubber latices is the use of Durez resin emulsions developed for this purpose. For modifying the properties of latex-treated papers, a water-soluble liquid resin is available. So far, the use of these resins is confined mainly to nitrile rubber latices. However, one Durez resin has produced very satisfactory results with certain high-styrene-butadiene latices.

For a more complete description of the application of Durez resins in compounding, in solvent cements, and in modification of latices, write for the illustrated bulletin, "Durez Resins in the Rubber Industry."

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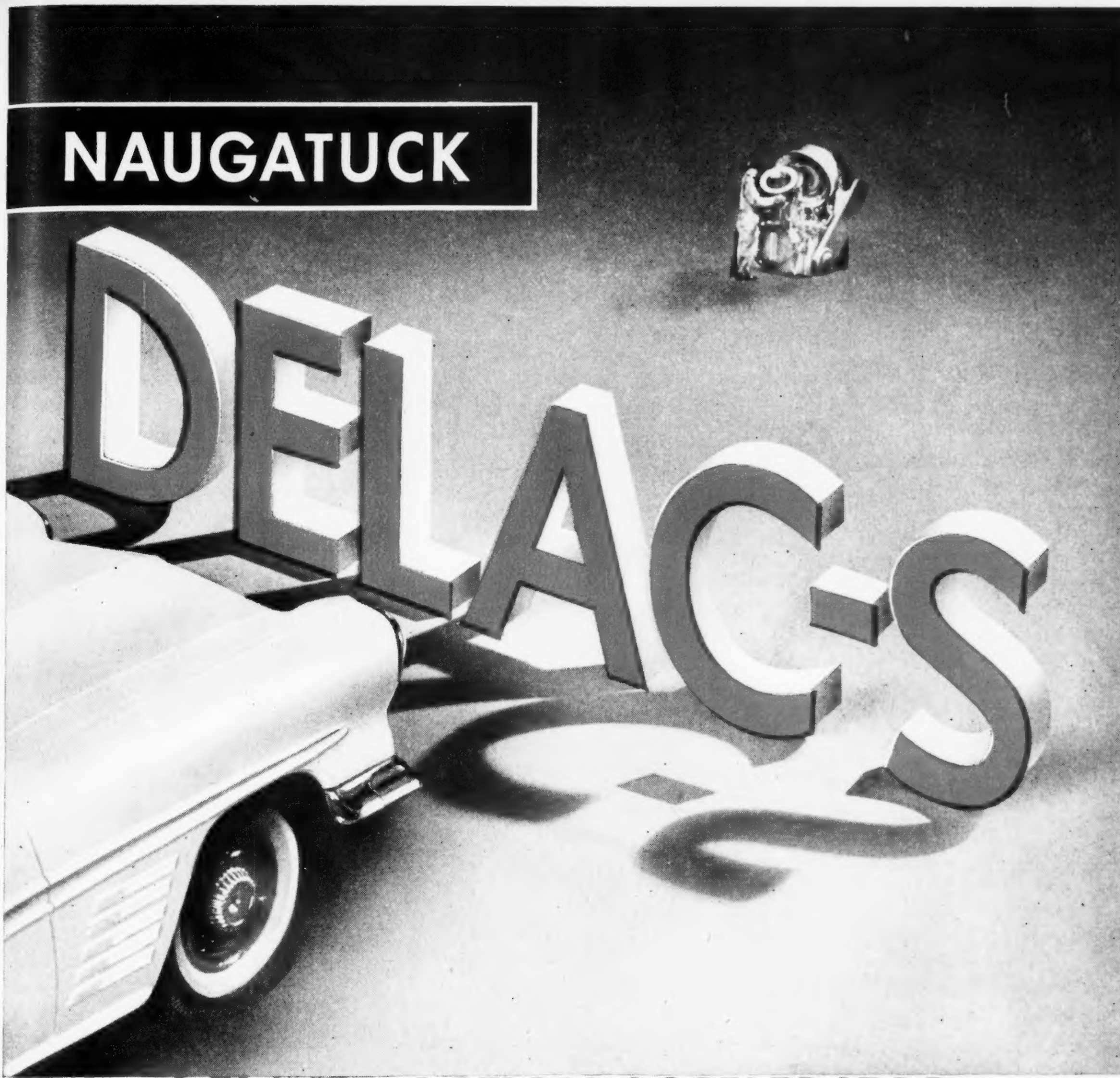

DELAYED ACTION ACCELERATOR

fast acceleration...when you want it

The growing use of the more scorchy furnace blacks and increasing demand for faster curing cycles pose an industry-wide problem. The answer is Naugatuck's DELAC-S delayed action accelerator.

The most stable of the sulfenamide accelerators, DELAC-S may be used as the sole accelerator, with full scorch safety and a curing time less than that of other delayed action accelerators. Or it may be compounded with Retarder J or with activators to give precisely the combination of processing speed and safety your particular operation requires.

An important additional advantage of DELAC-S is its relatively low cost. DELAC-S is available in mixed ton or truck shipments with Naugatuck Thiazoles. For more information on this new Naugatuck delayed action accelerator, write the address below today.

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This innovation in SBR rubber was developed by Goodrich-Gulf research for manufacturers of rubber adhesives, mastics, cements or other products where rubber raw material must be put in solution before processing. It cuts costs in molding and extrusion, too. Manual cutting of conventional bales of rubber to exact weight can be eliminated.

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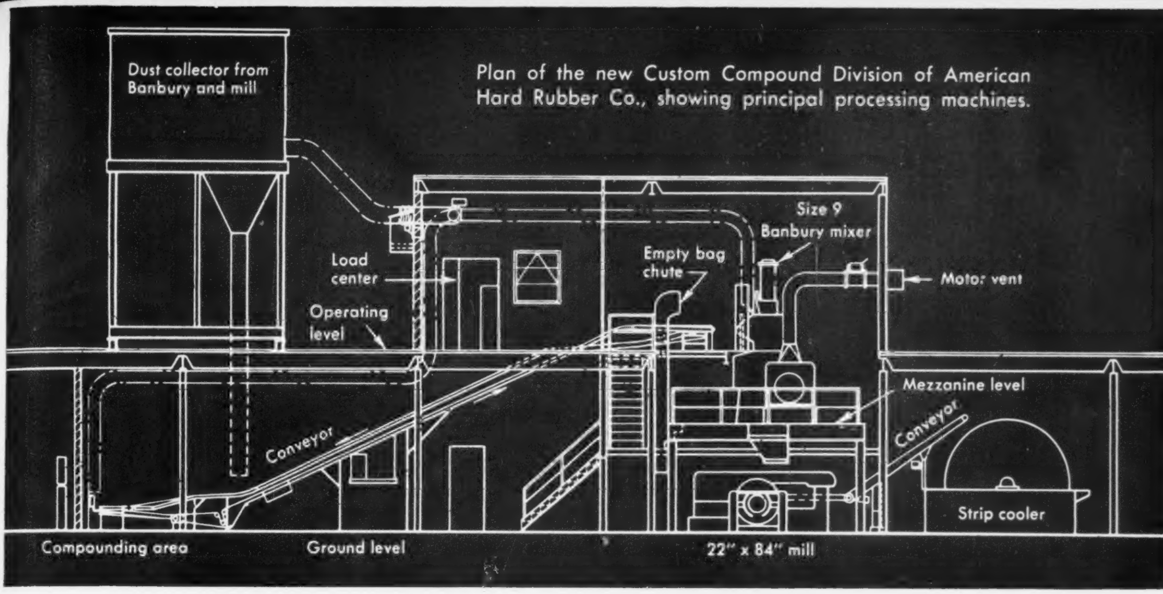
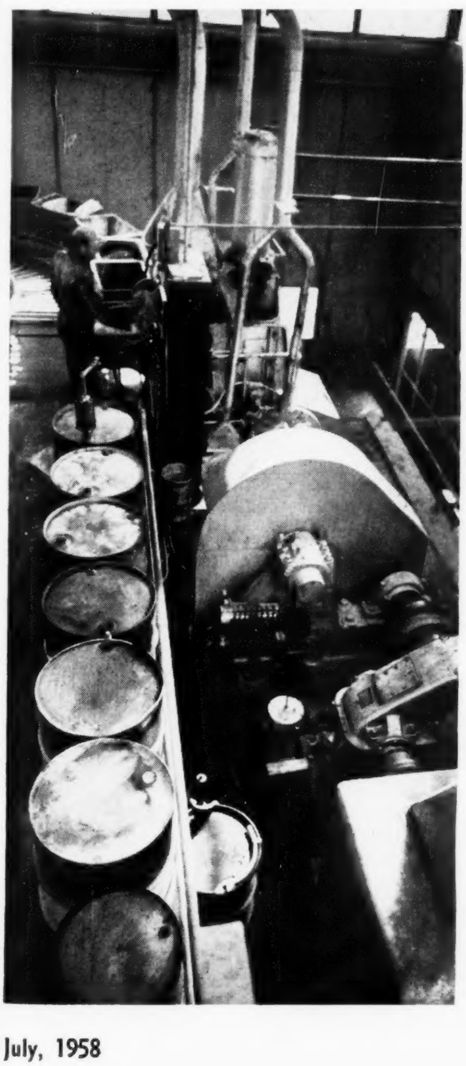


New rubber-compounding operation fully engineered by Farrel-Birmingham



In building a new rubber-compounding facility to serve the southeast, the American Hard Rubber Company of Butler, N. J., turned to Farrel-Birmingham's process engineering division for help in developing the processing layout.

Located near Tallapoosa, Ga., the plant was designed around a size 9 Banbury® mixer – installed directly over an F-B 84" two-roll mill. Ingredients for a mix are weighed, then conveyed to the Banbury, which thoroughly mixes and heats a 350 to 400 pound batch in 10 to 15 minutes. When the cycle is completed, the batch is discharged to the mill below, where it is rolled into strips or slabs, then cooled by riding a 12-foot wheel which turns in a bath of cold water.

According to Irving B. Tallman, manager of the new plant, "Farrel-Birmingham engineers planned our floor plan here and worked out just where every piece of machinery should go for everything to work smoothly. And this planning was not only for their own equipment, but for other makes as well."

The F-B process engineering division can tailor designs and plant layouts to your needs . . . can help you with your rubber-processing problem. Call or write for further information.

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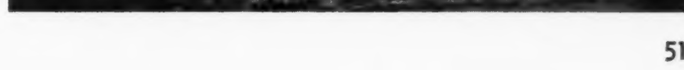

NOW... latex foam rubber *for less*

How a new "low-ammonia" latex cuts the high cost of compounding

An exclusive, new "low-ammonia" latex — imported from the Far East — now makes it possible for you to produce foam rubber for less, without sacrificing quality.

Pioneered, perfected, and patented by General Latex, this new product contains far less ammonia than ordinary latices, thanks to a newly developed co-preservative. Thus no ammonia removal is required before foaming — an entire compounding step is eliminated.

Unlike other "low-ammonia" latices, the new latex has analytical and processing characteristics similar to ordinary latex — does not interfere with the curing process and requires no change in the curing formulation. And it is completely interchangeable with high ammonia latex from which ammonia has been chemically or mechanically removed.

For full information on this cost-cutting development, write today.

PHOTO COURTESY OF NUKRAFT MANUFACTURING CO., INC., SHELBYVILLE, INDIANA

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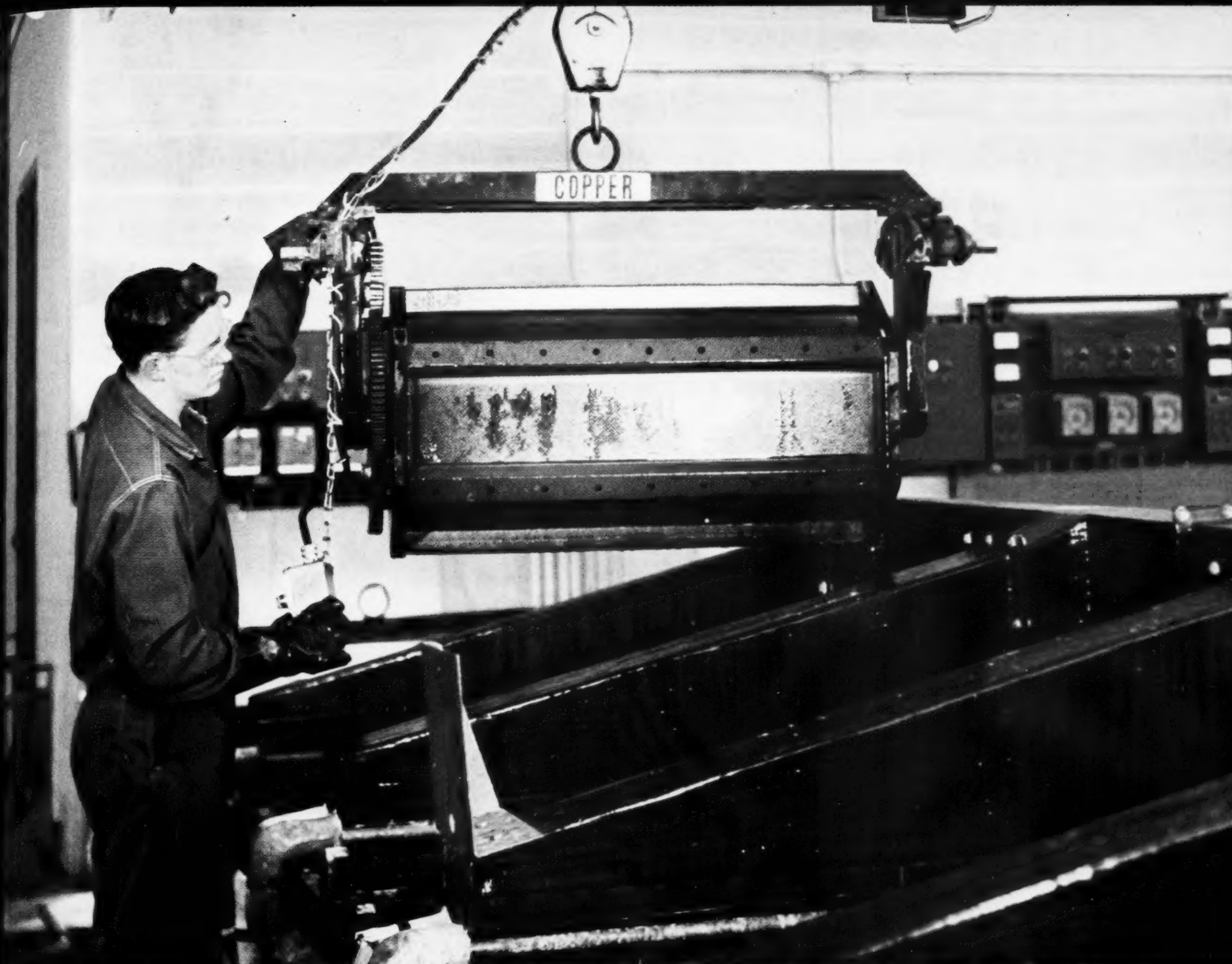

Photo courtesy American Hard Rubber Company, New York, N. Y. and Udylite Corporation, Detroit, Michigan

New Answer to a Barrel of Hot Problems

Hot problem for a leading supplier of electroplating barrels was finding the right material for the cylinders. In the face of repeated exposure to heat, hard wear and corrosive plating solutions, these cylinders had to keep rolling without contaminating the baths. After many tries, they found the answer—a new, clean-running hard rubber with three times longer life.

The major advance of this new material over its predecessors springs from the fact that it's made with CHEMIGUM nitrile rubber. Its manufacturer uses CHEMIGUM for a combination of strength plus resistance to high temperatures, chemicals and solvents never before achieved in hard rubber.

Besides better barrels for plating, CHEMIGUM as hard rubber has wide applications as pipe fittings and other equipment for handling chemicals at high temperatures. In other forms, CHEMIGUM finds use in many other products requiring unusual resistance to oils, solvents and chemicals over a wide range of temperatures.

If you have a need for an unusually versatile oil-resistant rubber of high quality, be sure you have the full story on CHEMIGUM. It's easy to get. Just write to: Goodyear, Chemical Division, Dept. **S-9418**, Akron 16, Ohio.

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Chemigum, Plioflex, Pliolite, Plio-Tuf, Pliovic—T. M.'s The Goodyear Tire & Rubber Company, Akron, Ohio

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High Polymer Resins, Rubbers, Latices and Related Chemicals for the Process Industries

Photo courtesy Ebonite Company, Newton 64, Massachusetts

It may be right down your alley, too

When you hold a bowling ball in your hands, you're holding years of experience along with a great deal of care in its manufacture. For few products are made to such exacting specifications.

That's why the make-up of a ball is never changed without careful consideration and thorough testing. That's also why it's safe to say a leading bowling ball manufacturer found PLIOFLEX rubber right down his alley for the outer shell of his product.

Surprisingly enough a bowling ball does start out as two different rubber compounds – a high gravity core and a super-tough shell. These are later fused into a hard, solid sphere. And it's to the shell that PLIOFLEX brings even greater toughness and a better finish plus extreme uniformity and easy processing – all at lower cost.

Perhaps you'll also find PLIOFLEX right down your alley for either hard or soft rubber goods. One thing certain, you'll find no finer rubber or service anywhere. For full details, write to Goodyear, Chemical Division, Dept. S-9418, Akron 16, Ohio.

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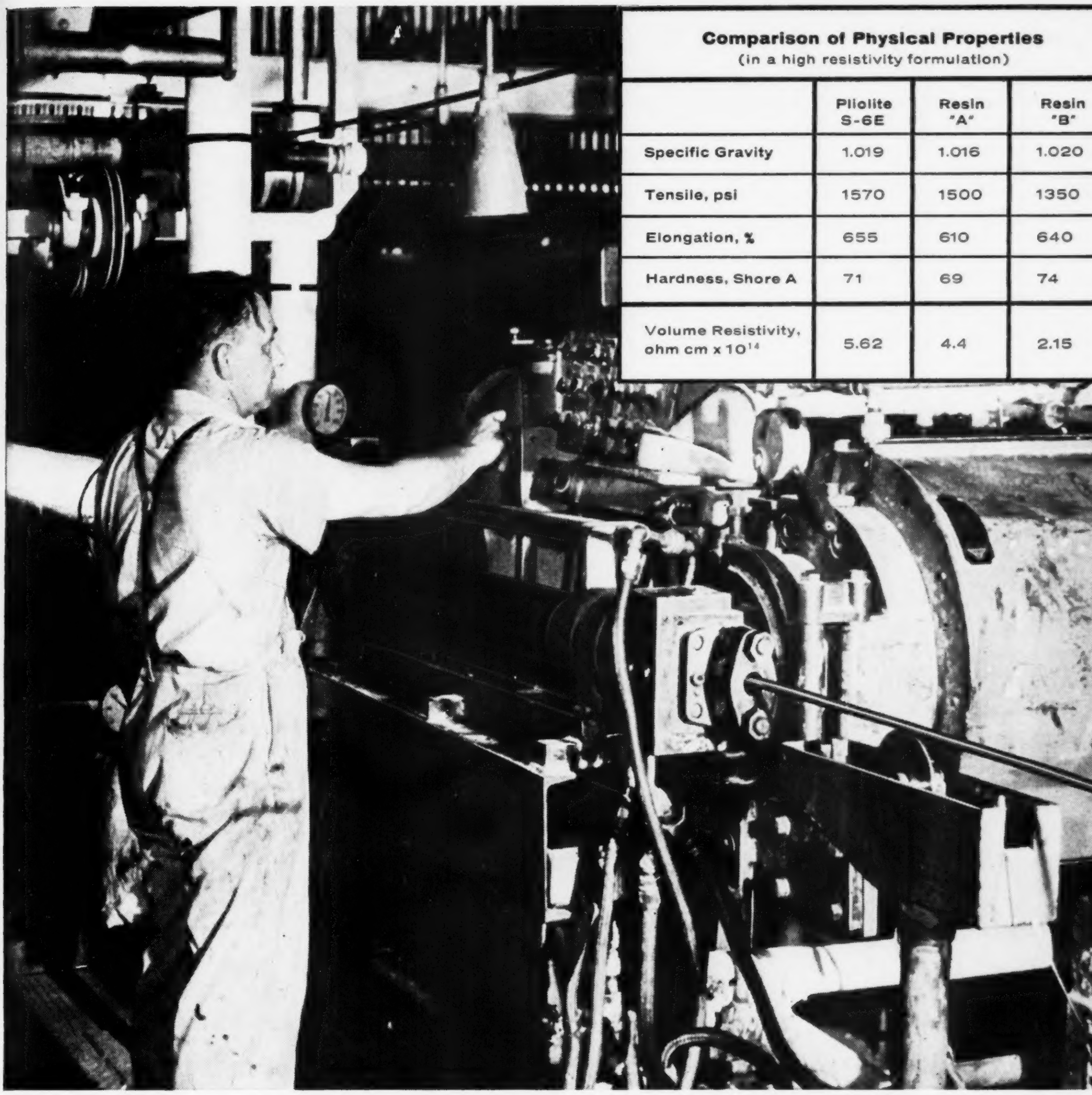

Comparison of Physical Properties (in a high resistivity formulation)			
	Pliolite S-6E	Resin "A"	Resin "B"
Specific Gravity	1.019	1.016	1.020
Tensile, psi	1570	1500	1350
Elongation, %	655	610	640
Hardness, Shore A	71	69	74
Volume Resistivity, ohm cm x 10^{14}	5.62	4.4	2.15

Photo courtesy, The Okonite Company, Passaic, New Jersey

New way to meet tight wire "specs"—with ease!

It's here! PLIOLITE S-6E—the new electrical grade, rubber reinforcing resin that will enable you to meet tight wire covering specifications with ease. In trial plant runs, for instance, PLIOLITE S-6E has been particularly successful in meeting the requirements for covering on HW and RW Wire.

PLIOLITE S-6E is a new high styrene/butadiene copolymer which not only exhibits superior electrical properties (see data above), but also processes and reinforces on a par with any resin on today's market. And best of all, it's offered at the same price as ordinary reinforcing resins.

We think you'll be pleasantly surprised at just how well PLIOLITE S-6E performs. But the best way to find out is to put it through its paces yourself. Samples and full details, including the latest *Tech Book Bulletins*, are yours by writing Goodyear, Chemical Division, Dept. S-9418, Akron 16, Ohio.

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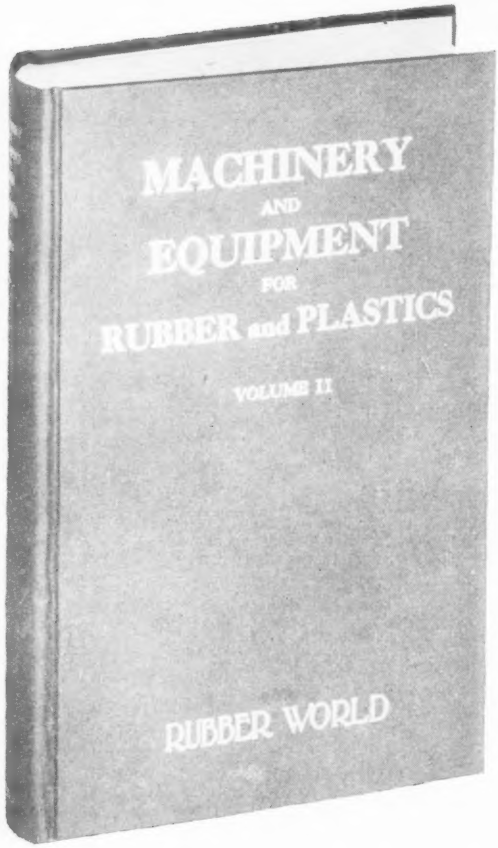

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Add $2\frac{1}{2}$ to 3% Polymel RC 57 to synthetic or natural rubber stocks which have become scorched - - or have become partially set. After milling until smooth - - use them exactly as fresh stock.

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Grind the mold trim on a tight mill and add very slowly 8 to 10% Polymel RC 57 to the shredded trim, mill together until mass is homogenous. When mixing new batch of same material, add 10% of the reclaimed trim. There will be no change in the hardness or time of cure of the new batch.

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The market for foam rubber is growing rapidly. An efficient mold release agent helps you get maximum output of high quality products. That is why you should consider UCON rubber lubricants as mold release agents.

UCON rubber lubricants have been proved outstanding by years of extensive use. They are easily applied and give clean, quick release. And, UCON rubber lubricants usually reduce or eliminate mold cleaning problems frequently encountered in foam rubber production. UCON rubber lubricants are available in both *water-alcohol* soluble and *gasoline* soluble series—they can also be emulsified.

UCON rubber lubricants can help you make a better foam rubber product. Write for samples and further information . . . address Department B.

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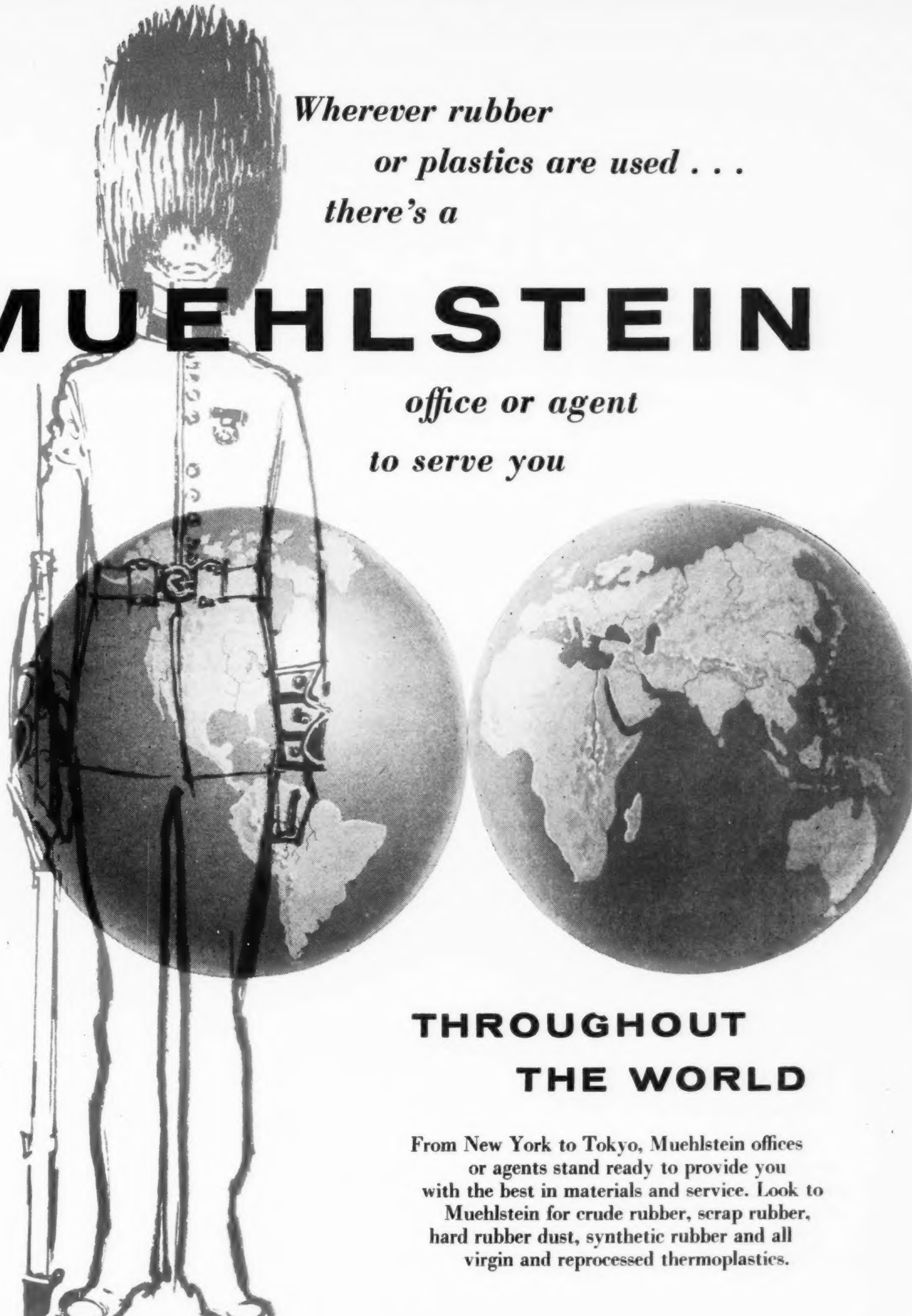

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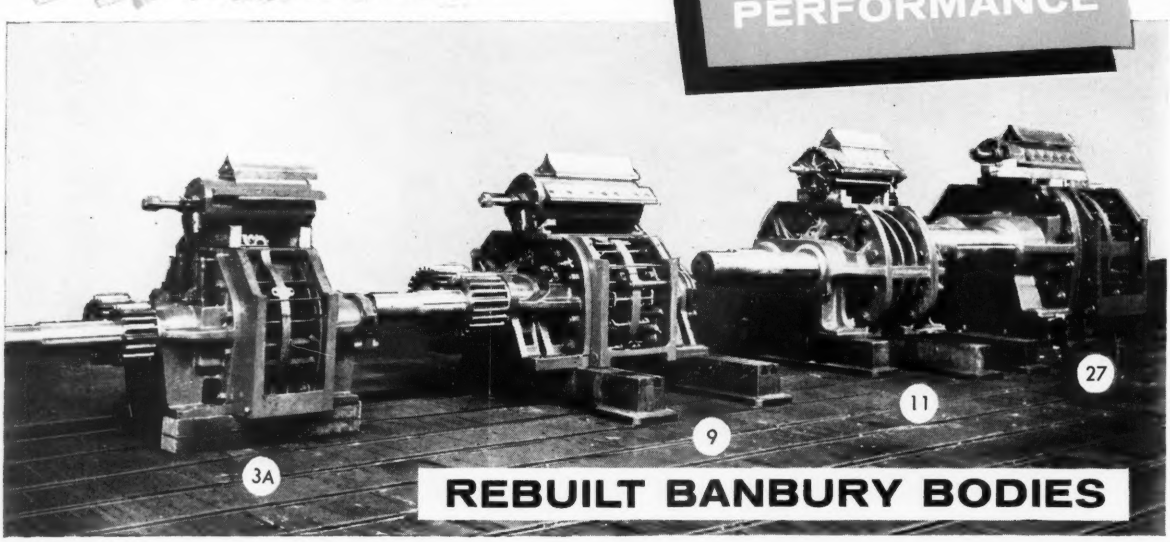

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For brilliant colors that last . . . and economy too . . . there is no better rubber than Shell S-1006 (hot) or S-1502 (cold). Both are light-colored, non-staining and well-suited for white or colored products of all kinds.

The Shell Chemical plant at Torrance, California, is your source of a full line of butadiene-styrene synthetic rubber . . . hot, cold, oil-extended and black masterbatch, as well as hot and cold latices.

To help you use these synthetic rubber products to best advantage, the Shell Technical Service Laboratory offers expert assistance. Write, phone or drop in and see us for a catalog and information on specific types of synthetic rubber. Our number in Los Angeles is FAculty 1-2340.

SHELL CHEMICAL CORPORATION

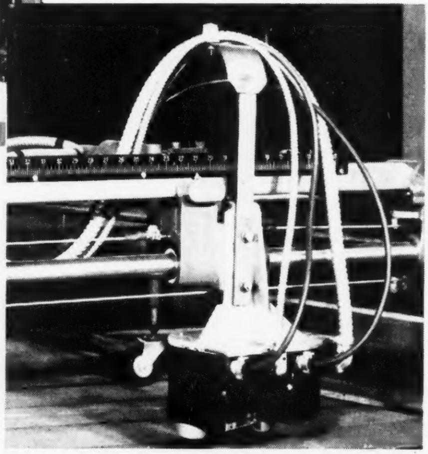
Synthetic Rubber Sales Division
P.O. Box 216, Torrance, California

SHELL

FULLY AUTOMATIC

NRM BIAS CUTTERS

- **SPEED PRODUCTION**
- **INCREASE ACCURACY**
- **REDUCE WASTE**



ELECTRONIC "CONTROL HEAD" ASSURES FASTER, MORE PRECISE OPERATION

A unique double scanner system, together with many other advanced design features, combine to make this NRM fully automatic horizontal Bias Cutter the most efficient machine available for fabric and ply cutting operations.

Simple, quick adjustments for cutting blocks of stock from 11″ to the maximum required, are a feature of both the 66″ and 72″ tables. Cutting angles are from 45 to 90 degrees. Block widths may be read direct from the calibrated scale on the cutter bar, regardless of the cutting angle. Standard over-all dimensions of tables in 5′ increments are from 20′ to 80′. Speed of the cutting cycle is standard at 20 cuts per minute, within plus or minus 1/32″.

At no obligation we will supply complete details on the fully automatic Bias Cutter. Get the facts and see for yourself *why* stock preparation with NRM Bias Cutters is more accurate and efficient.

Check your rubber machinery needs against the NRM complete line Today!

NATIONAL RUBBER MACHINERY COMPANY

NRM

General Offices and Engineering Laboratories, 47 West Exchange St., Akron 8, Ohio

West: S. M. Kipp, Box 441, Pasadena 18, Cal.

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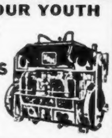
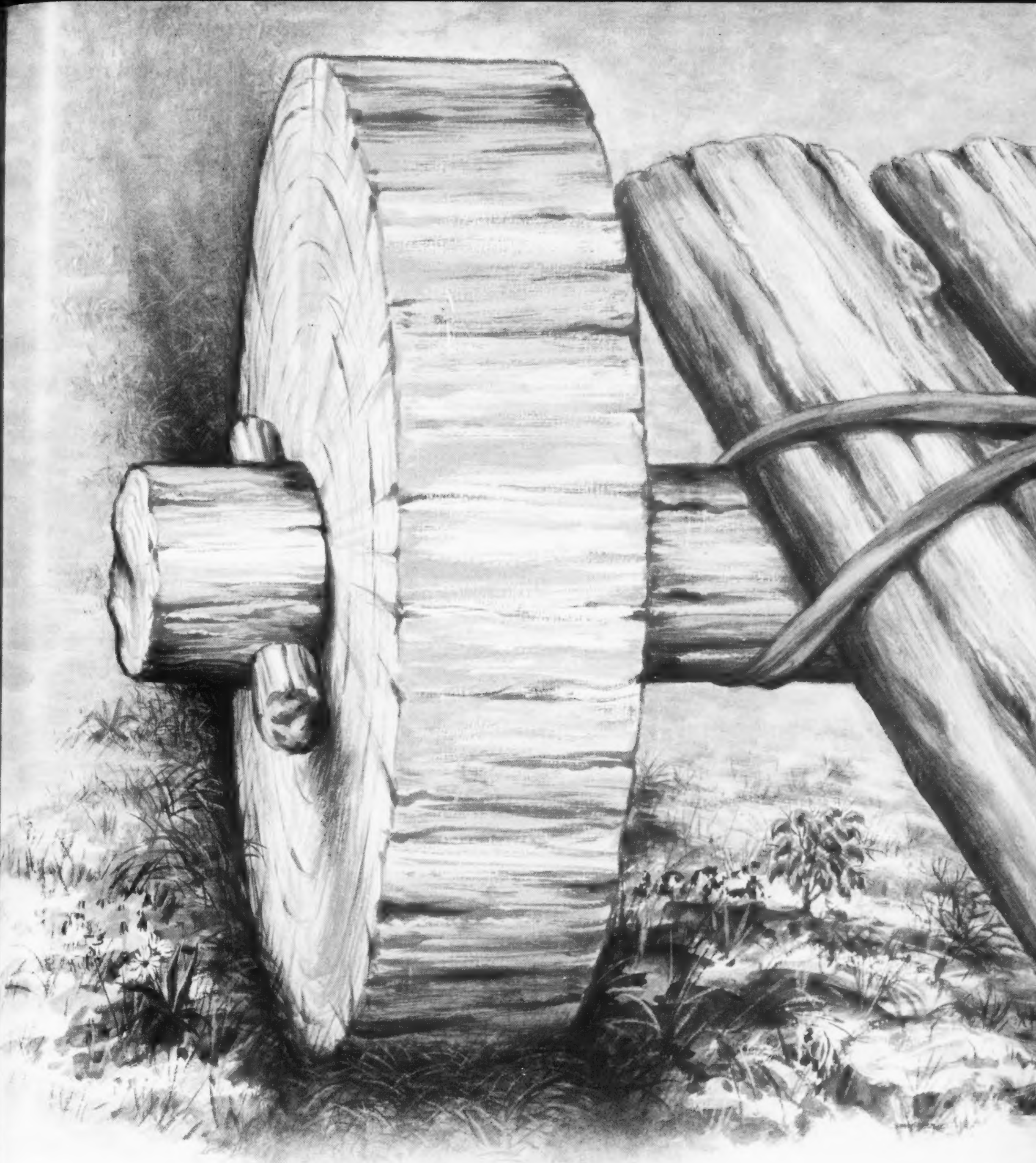
2378-2

ENCOURAGE OUR YOUTH To CONSIDER The OPPORTUNITIES In ENGINEERING and SCIENCE





CIVILIZATION STARTED WITH A LAZY MAN

Man discovered the wheel and its significance while simply seeking an easier way to transport himself and his goods.

Primitive man first had carried all his belongings on his back. We may assume that later in his search for the "easier way" he loaded these belongings on his wife's back. She, in turn, packed them on the family bullock. And, with the passage of time, they learned that the bullock could pull more, on a skid or sledge, than he could carry.

And then — but we don't know when — the wheel! Today's wheel has been amazingly refined in the continuing search for the "easier way." The development of the rubber tire marked an epochal point in this search. The rubber tire, reinforced with carbon black, has put the world on wheels — it has made transportation swift and sure as well as easy.

If you, as a rubber manufacturer or compounder, are looking for an "easier way" — a sure and superior way — specify UNITED CARBON BLACKS!

One of a Series on Man and the Development of Transportation

UNITED CARBON COMPANY, INC.

KOSMOS

is the key word for carbon black when the aim is superior reinforcement.

KOSMOS Blacks are produced scientifically in 15 types by furnace and channel processes from carefully selected oils and from natural gas.

KOSMOS Blacks rate high for safe, easy processing; fast, tight cure; maximum reinforcement and equally high resistance to wear, tear, flex and aging.

KOSMOS Blacks are up to date in quality, highly uniform, and designed to strengthen rubber for exceptional service. They have been used world-wide for decades to give better performing rubber.

There is a **KOSMOS** Black to suit the most discriminating compounder, meeting his requirements for every type rubber and practically every application.

Avoid doubt. Standardize on **UNITED CARBON BLACKS.**

UNITED CARBON COMPANY, INC.

A subsidiary of United Carbon Company

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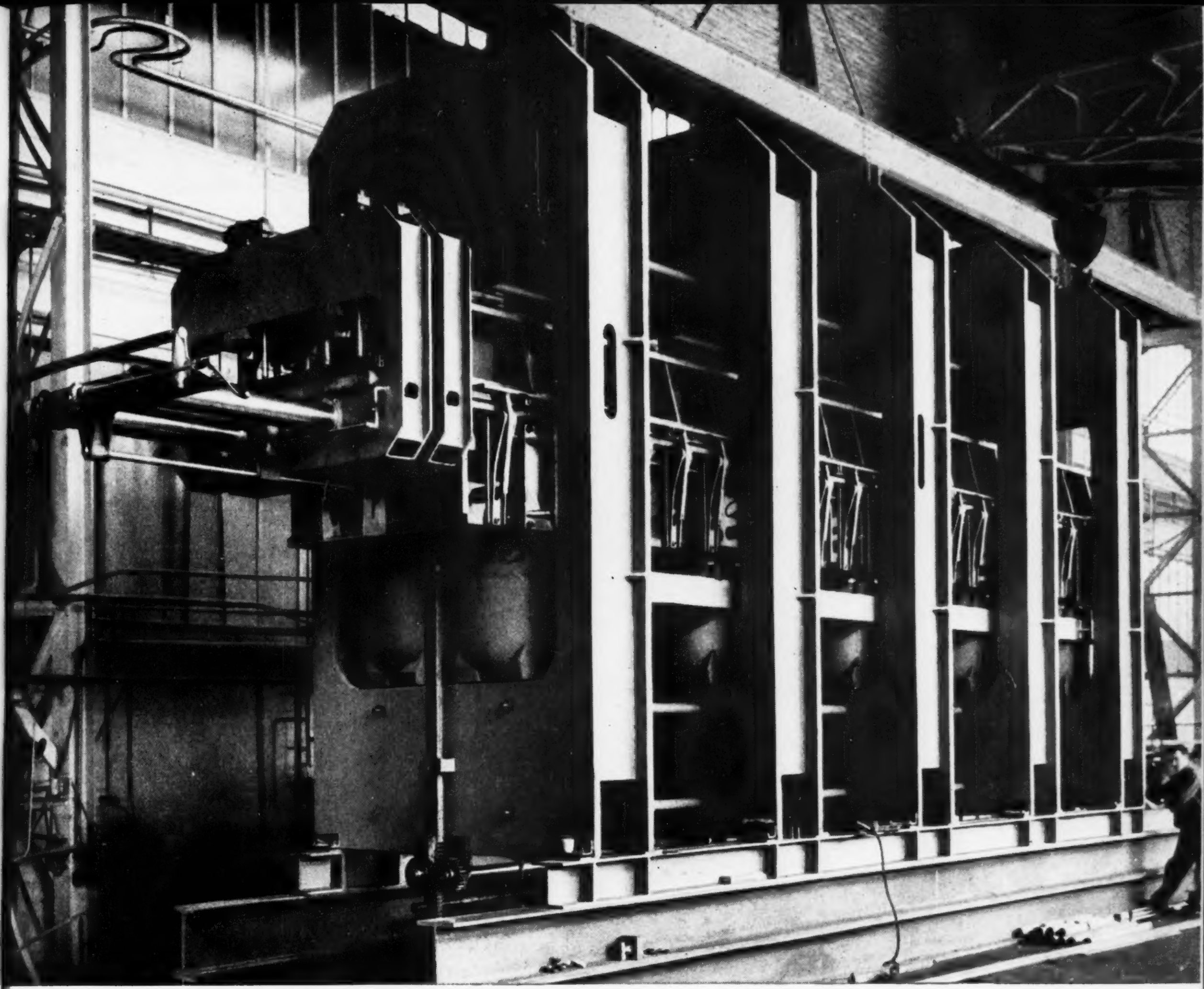
IN CANADA: CANADIAN INDUSTRIES LIMITED



Leading rubber plants

all over the world operate our

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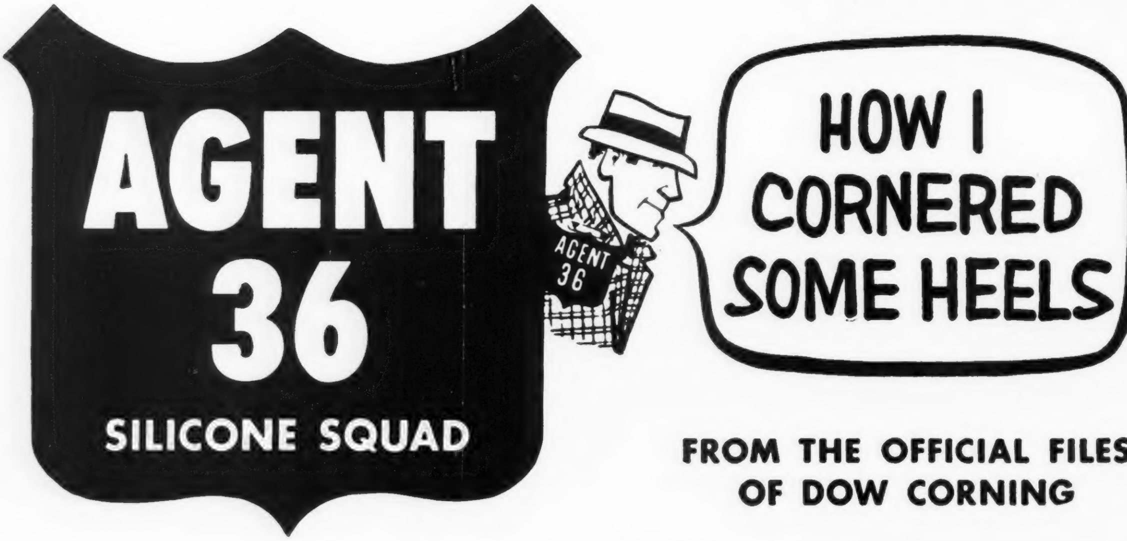

FROM THE OFFICIAL FILES OF DOW CORNING

PRODUCTION IS FLIPPING, BUT WE CAN'T PASS SHODDY WORK!
YOUR TROUBLE COMES FROM MONSTER MC GOO. BUT DON'T BE A CREPE-HANGER. DOW CORNING SILICONES WILL GET RID OF HIM.
PARTING IS SUCH SORROW
LES MESS INSP.
AGENT 36
GO GAGE
GO-GO GAGE
REJECT
5
YOUR MOLDS ARE SICK, SICK, SICK. WE'LL HEAL THEM (SIC) WITH SILICONES. BE GONE, MC GOO!
AGENT 36
6
YOU'RE THE VANGUARD XXXVI.
SILICONES KEEP GOO FROM FORMING, REDUCE SCRAP, GIVE BETTER SURFACE DETAIL, SPEED PRODUCTION, CUT MOLD MAINTENANCE.
AGENT 36
7
YOU'RE REALLY IN ORBIT.
ALWAYS WITH DOW CORNING SILICONES. THEY NEVER LET YOU DOWN.
THAT SURE SPEEDS THE PARTING, GUEST!
AGENT 36
8
YOU CAN'T FIND A BETTER RELEASE AGENT THAN 36 EMULSION. GET YOUR FACTS. DOW CORNING'S THE SOURCE. DO IT NOW!
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Toughens RUBBER FORMULATIONS

Of all the muscle-building ingredients used by plastics formulators and rubber compounders to develop specification - toughness, Claremont Cotton Fillers have proven the most satisfactory. Many, many millions of pounds of Claremont Fillers have already shared in making many more millions of plastic parts and rubber products functionally strong.
Available in several classification-grades from fine flock to macerated fabric pieces. Strict quality manufacturing controls assure uniformity.

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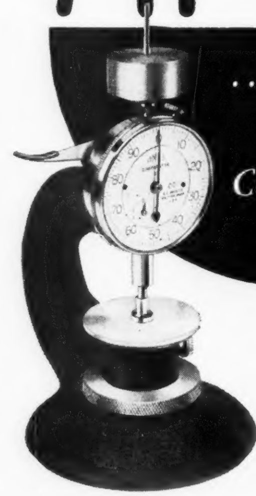

No. 2W Dial Comparator

Dimensional checking is fast, easy and accurate with Ames Dial Comparators. You get definite, impersonal readings right from the dial. There's no guesswork or figuring.

Special comparators are available for measuring all forms of rubber and plastic. Write today for complete information.

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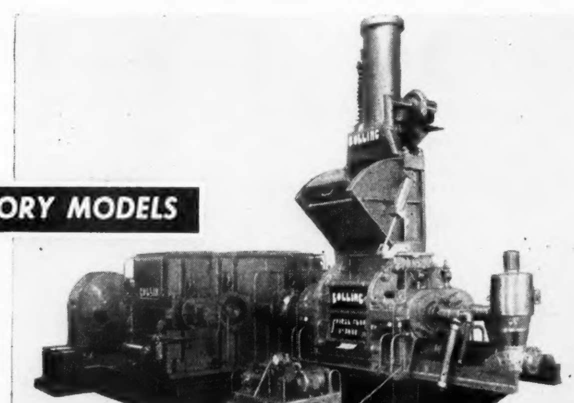
MANUFACTURERS OF MICROMETER DIAL GAUGES • MICROMETER DIAL INDICATORS

INTENSIVE ...BUT NOT EXPENSIVE MIXING by Stewart Bolling

PRODUCTION MODELS • LABORATORY MODELS



No. 4 Bolling Spiral-Flow Intensive Mixer of 5100 cu. in. capacity, with 300 h. p. compound type helical drive, illustrating special motorized discharge door assembly.

Bolling builds 4 production sizes for a range of capacities: No. 3 (3400 cu. in.), No. 4 (5100 cu. in.), No. 10 (12160 cu. in.), No. 12 (16000 cu. in.). Also one production-laboratory model —No. 1B (1200 cu. in.). Also one laboratory model—No. 0 (275 cu. in.).

In Bolling mixers, laboratory or production size, you get:

Spiral-Flow Sides for the heating or cooling of stock, which give greater thermal efficiency ... *Split End Frames* which permit rotor removal without completely dismantling ends of machine ... *Anti-Friction Bearings* for optimum power, smoother running, and longer life. No end zone movement of rotors ... Stewart Bolling production mixers offer other outstanding advantages for profitable operation; rotors with full circle end flanges; compound, dual or conventional geared drives, and other features.

Write on your letterhead for Mixer Bulletin

INTENSIVE MIXERS • MILLS • CALENDERS • REFINERS • CRACKERS
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PANAFLEX BN-1 Plasticizer—possibly your answer to lower-cost plastisol and extrusion formulations

PANAFLEX BN-1 has demonstrated excellent capabilities as a viscosity stabilizer for vinyl plastisols in storage. In large-volume applications of both plastisols and extrusion compounds, PANAFLEX BN-1, as an extender·plasticizer, may help you make important savings by giving you an equal-quality finished product at a lower cost per pound of compound.

PANAFLEX BN-1 is a clear, light straw-colored liquid. It has efficient plasticizing properties, is easy to process. It possesses first-rate electrical properties and has good moisture resistance. It is nonmigratory, and it will not support fungi.

Like more facts about PANAFLEX BN-1 Plasticizer? Your request for further information will receive an immediate reply.

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Summer is fun on the beach but not in the mill room—but even if the weather is scorching, your Neoprene will not when you use D C I Light Magnesium Oxide in your stocks. Call on D C I for summer safety. Write for NEW, complete catalog.

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How Oakite Rustripper Improves Mold Cleaning

- **SOAK TIME CUT** —*from 24 hrs. to 6 hrs.*
- **COST PER MOLD CUT** —*from $7.21 to $1.25*

These results are from the report of a mid-western rubber company cleaning steel molds of heavy deposits of rubber and mold release lubricant. They prove again that it's faster and costs less to clean molds with Oakite Rustripper . . . and the molds come out cleaner, at that.

Maybe Oakite can help you, too, in lowering maintenance costs. Call your local Oakite man, or write for free booklet, "New Ideas in Cleaning for the Rubber Industry," to Oakite Products, Inc., 47 Rector Street, New York 6, N. Y.

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MATERIALS · METHODS · SERVICE
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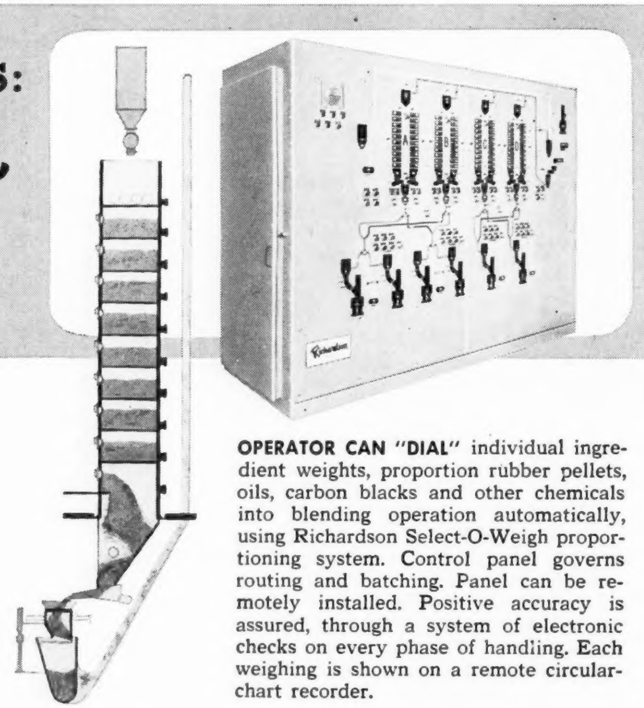
RUBBER PELLETS: Now Richardson stacks 'em so they don't stick!



"NO-STICK" PROPORTIONING of rubber pellets starts with Richardson's unique "step-ladder" stack bin design. Installation shown has 10 separate storage bins to a stack. Each bin holds a *small* mass of pellets—too light to compress or stick. Pneumatic discharge slide gates make bin-to-bin transfer easy, efficient. Bottom hopper has vibrating feeder to accurate, automatic Richardson weigh scale. The entire operation can be controlled through a Richardson Select-O-Weigh panel.

OPERATOR CAN "DIAL" individual ingredient weights, proportion rubber pellets, oils, carbon blacks and other chemicals into blending operation automatically, using Richardson Select-O-Weigh proportioning system. Control panel governs routing and batching. Panel can be remotely installed. Positive accuracy is assured, through a system of electronic checks on every phase of handling. Each weighing is shown on a remote circular-chart recorder.

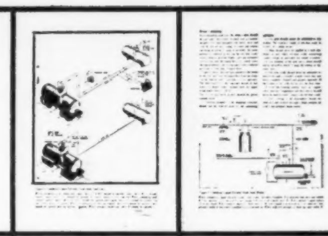
Like to start solving a difficult proportioning problem?
Call or write today, for prompt, free information.
Richardson Scales conform to U.S. Weights and Measures H-44 for your protection.

Richardson
MATERIALS HANDLING BY WEIGHT SINCE 1902

RICHARDSON SCALE COMPANY • CLIFTON, NEW JERSEY
Sales and Service Branches in Principal Cities
Also Manufactured in Europe to U.S. Standards

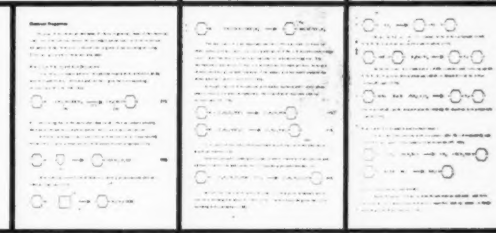
Ethylene Oxide

"When unloading with compressor vapor valves, N-K-B-F should be opened. Vapor valves M-J-L should be closed."



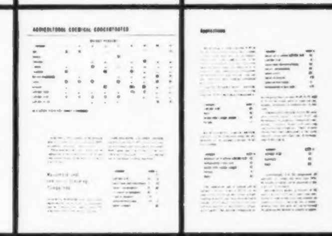
Morpholine

"Like most secondary amines, morpholine reacts with carboxylic acids and their anhydrides . . ."



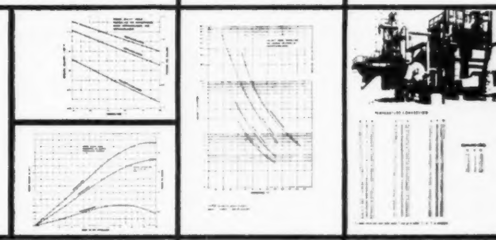
Surfonic Surface-Active Agents

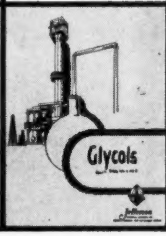
"Liquid dishwashing detergents are easily formulated using SURFONIC N-95. One typical formulation is . . ."



Ethanolamines

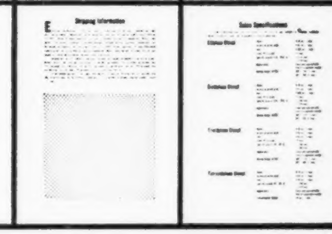
". . . Specific gravity versus composition for aqueous solutions at 20°C . . ."





Glycols

"Shipments in 55-gallon, resin-lined drums are made promptly from local warehouse stocks, in carload, truckload or . . ."



Excerpts from Jefferson technical literature

The information you want—on reactions, formulation, properties, handling and service . . . you'll find in

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Application information, methods of analysis and bibliography references—are just a part of the complete Jefferson service.

Every Jefferson bulletin tells you the whole story—clearly and concisely. Let us send you the bulletins that cover your product interest.

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Morpholine
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Lead & Zinc Compounds
meet the specific demands of the rubber industry . . .

Eagle-Picher manufactures a comprehensive line of both lead and zinc compounds for the rubber industry. Rigid product control is maintained from the ore to the finished product. More than a century of experience assures you of customer service unequalled in the field.

Zinc Oxides	Litharge
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THE STAMFORD RUBBER SUPPLY CO.
Vulcanized Oil

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LEADERS IN THE FIELD
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...wins two ways

- higher quality and lower cost
- cleaner plant operation

CARBOMIX is the **FIRST** commercially produced SUPER-DISPERSED black masterbatch

pioneering · good service · well-packaged · uniformity

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Make it Better with

MARBON

Marmix®

RESIN LATICES

- **EXTRA TOUGHNESS**
- **VERSATILE**
- **INCREASED TEAR RESISTANCE**

More and more manufacturers in various fields are turning to MARMIX for the essential qualities that make end-products more appealing, more practical. In *wax emulsions*, MARMIX contributes to increased film hardness and adhesion. When MARMIX is used in dipped *latex goods* your product has increased tear resistance, hardness and tensile strength; while in foamed latex goods, MARMIX offers improved dimensional stability plus such benefits as reduced shrinkage and a higher compression modulus. MARMIX also protects *rug backings* against warping or curling effects, and allows for higher pigment loading. *Paper products* employing MARMIX as a saturant or additive offer such important benefits as extra resistance to tear and delaminations, as well as greater protection against moisture, grease, oil and chemicals.

To assure a better product, and at lower cost —specify MARMIX.

Get the facts . . . *WRITE TODAY FOR FULL DETAILS AND SAMPLES*

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SYNTHETIC RESINS

Division of BORG WARNER • Gary, Indiana

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WEST COAST: Harwick Standard Chemical Co., Los Angeles, Cal.
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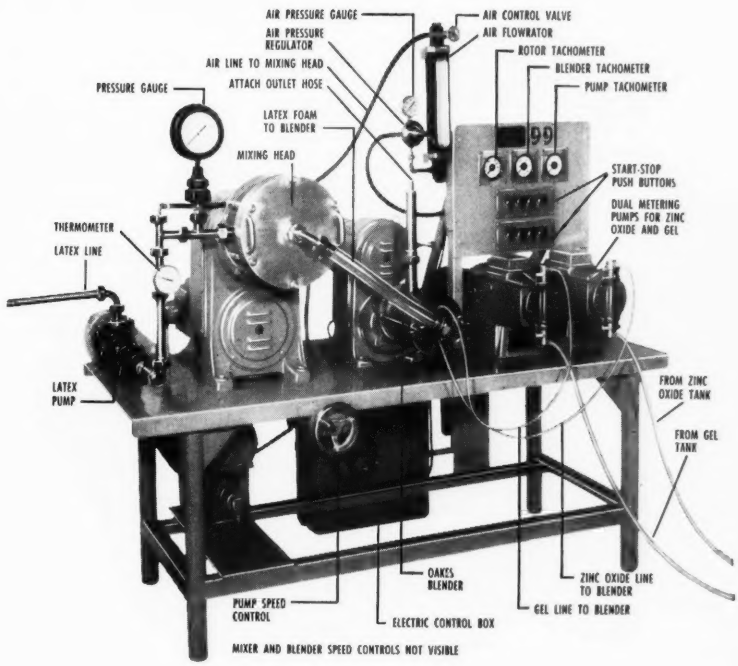
A TEAM FOR TOP FOAM RUBBER PRODUCTION



In foam rubber plants all over the world you will find an OAKES CONTINUOUS AUTOMATIC MIXER AND OAKES BLENDER at work for hours on end, producing latex foam up to 1,800 pounds an hour, without stoppages. Latex is foamed in the Oakes Mixer and flows continuously into the Oakes Blender, where zinc and gel are added. Since the coagulants are added *after* the foam has left the mixing head there is no coagulation in the mixing head and no need for stoppages for cleaning. If a build-up should occur at any time in the blender head, a twist of two thumb screws permits dismantling for quick and easy cleaning.

Three sizes of Oakes Mixers are now available to fit the requirements of the smallest to the largest plant. The Oakes Blender is of one size, available in single or dual units.

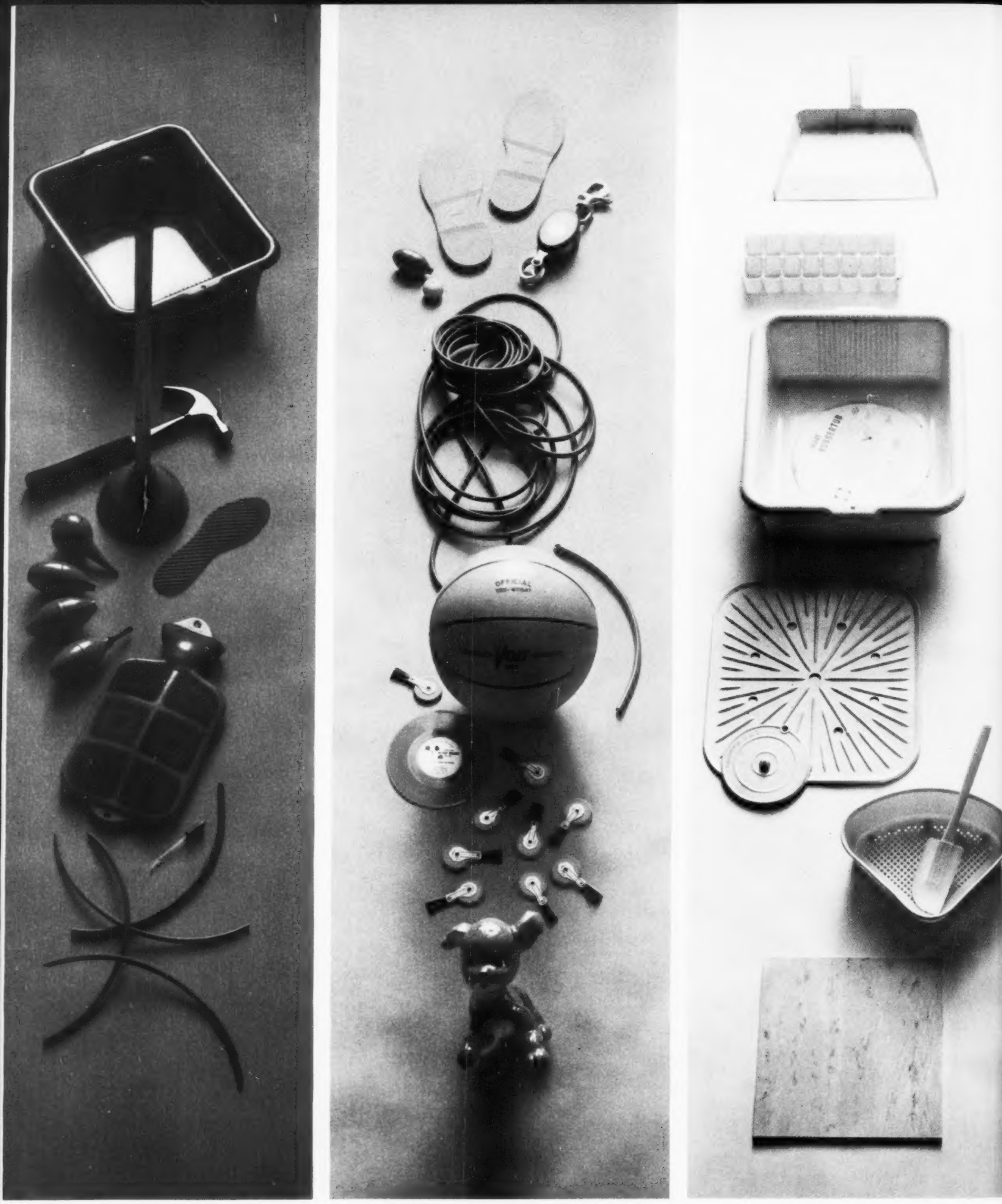
In addition to foam rubber applications, the Oakes Mixer is also used to produce vinyl sponge, plastisol, elastomer, acrylic and certain formulations of polyurethane foams. It is extensively used for dispersing pigments and similar materials through a carrying medium. It lends itself, in fact, to continuous mixing processes of all kinds and is especially adaptable to multiphase systems, such as those which involve two immiscible liquids, a gas and a liquid, a liquid and a solid or, as in the case of hydrogenation and similar processes, all three in a single process. In any process where a chemical reaction depends upon constantly exposing fresh surfaces of one or more of the reacting substances, the Oakes Continuous Automatic Mixer is particularly indicated.

OAKES **The E. T. OAKES CORPORATION** OAKES

26 Commack Road

ISLIP, LONG ISLAND, NEW YORK, U. S. A.

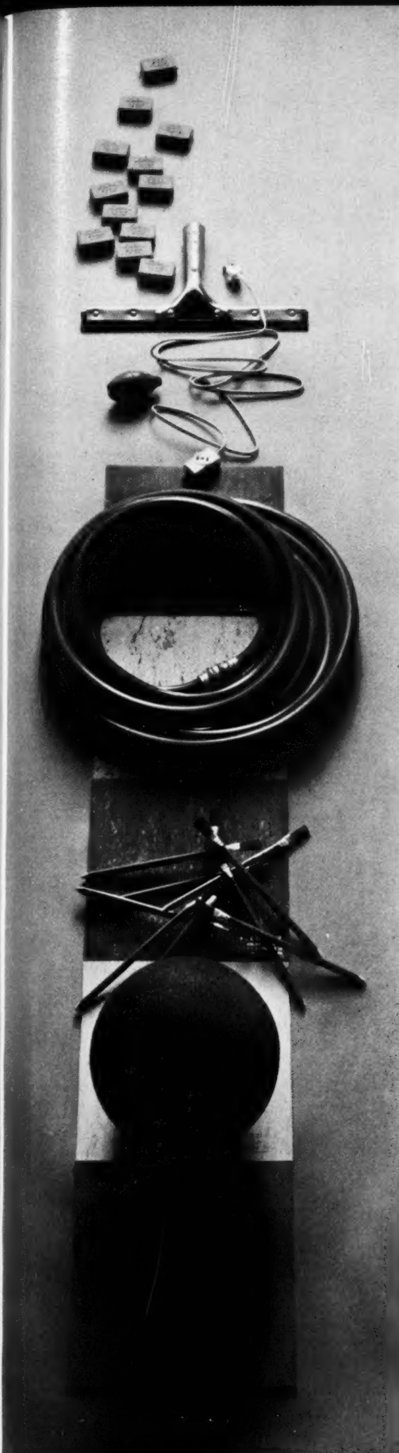
Export Representative: VANDERBILT EXPORT CORP., 230 Park Avenue, New York, N. Y.



Contact Columbia-Southern for specific information on brand names and availability of any of these quality rubber goods.

HI-SIL®, CALCENE®, & SILENE®
MAKE COLORFUL NEWS IN HUES

goods.



Photographed by Becker-Horowitz

Soling to syringes, swim fins to spatulas, stoppers to stair treads—and from smoked sheet to silicone—a rainbow of products for bright and dependable service rises from Columbia-Southern white reinforcing pigments.

Hi-Sil, Calcene and Silene are the quality materials helping to make possible the top-grade, spectrum-spanning articles you see above. Subtle pastels, vivid brights, true deep tones . . . they're all obtainable, along with excellent physicals, in goods of every description to meet modern consumer and industrial needs.

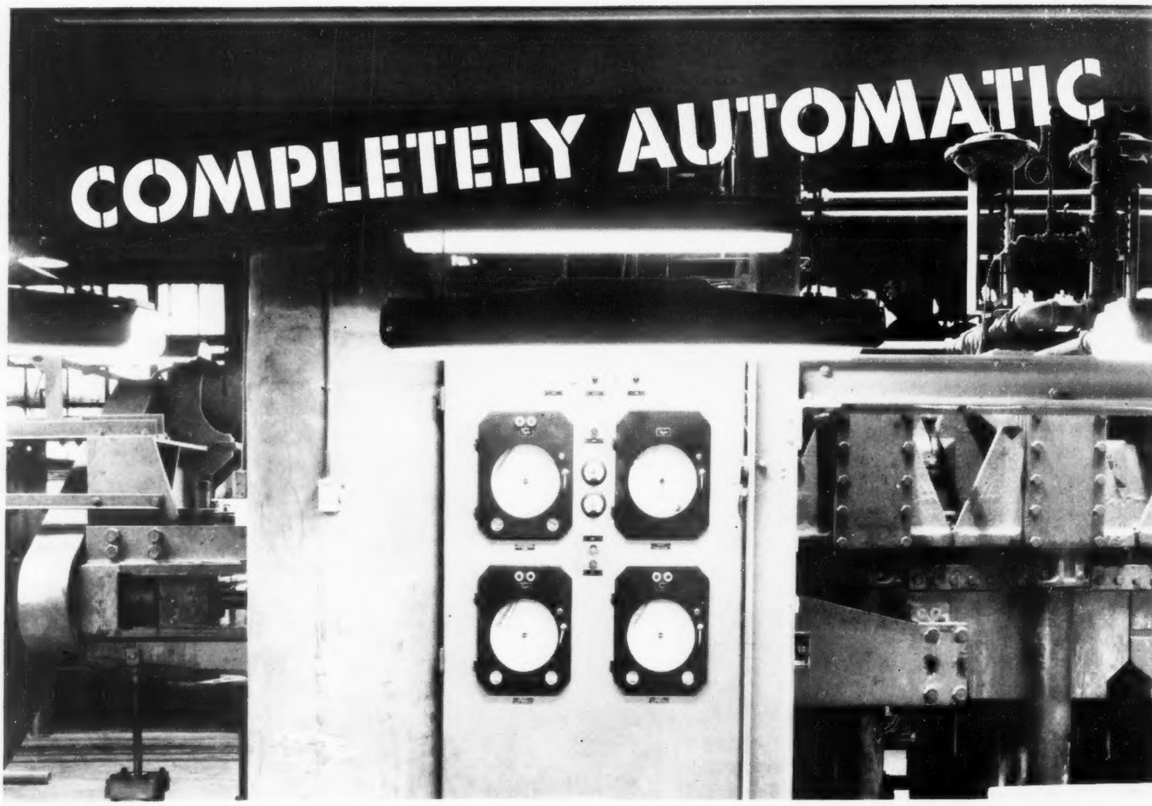
Why not re-examine your own product line? Perhaps a brand-identifying color will materially help your sales appeal and profit picture. If you've already gone to color, perhaps some upgrading with these Columbia-Southern pigments is in order. For particular and individual formulation help, just address us at Pittsburgh or the nearest of our fourteen District Sales Offices.

The Columbia-Southern Chemical Corporation, One Gateway Center, Pittsburgh 22, Pennsylvania. Offices in principal cities. In Canada: Standard Chemical Limited.

ES

COLUMBIA-SOUTHERN CHEMICAL CORPORATION

A Subsidiary of Pittsburgh Plate Glass Company



Hamilton Rubber bought their Taylor Belt Press Control *Pre-Packaged!*

HAMILTON Rubber Manufacturing Corporation of Trenton, N. J. ordered this new Taylor Automatic Belt Press Control System for rubber-coated conveyor belting; rubber impregnated transmission belting; solid sheet rubber; cloth inserted rubber sheeting; diaphragm sheeting. Hamilton Rubber saw many advantages in Taylor's recommendation that the system be prewired, prepiped and mounted on a panel. This reduced installation time, and simplified start-up.

Taylor's automatic Press Control System offers these operating advantages:

1. The press is "bumped" to remove gases from the belting, and the platens are brought to temperature and held for a pre-determined time. Automatic operation of the presses eliminates errors by the operator, thus insuring a uniform, high quality product.

2. The heating controls are designed to prevent overheating and overcuring, as well as blistering due to local overheating.

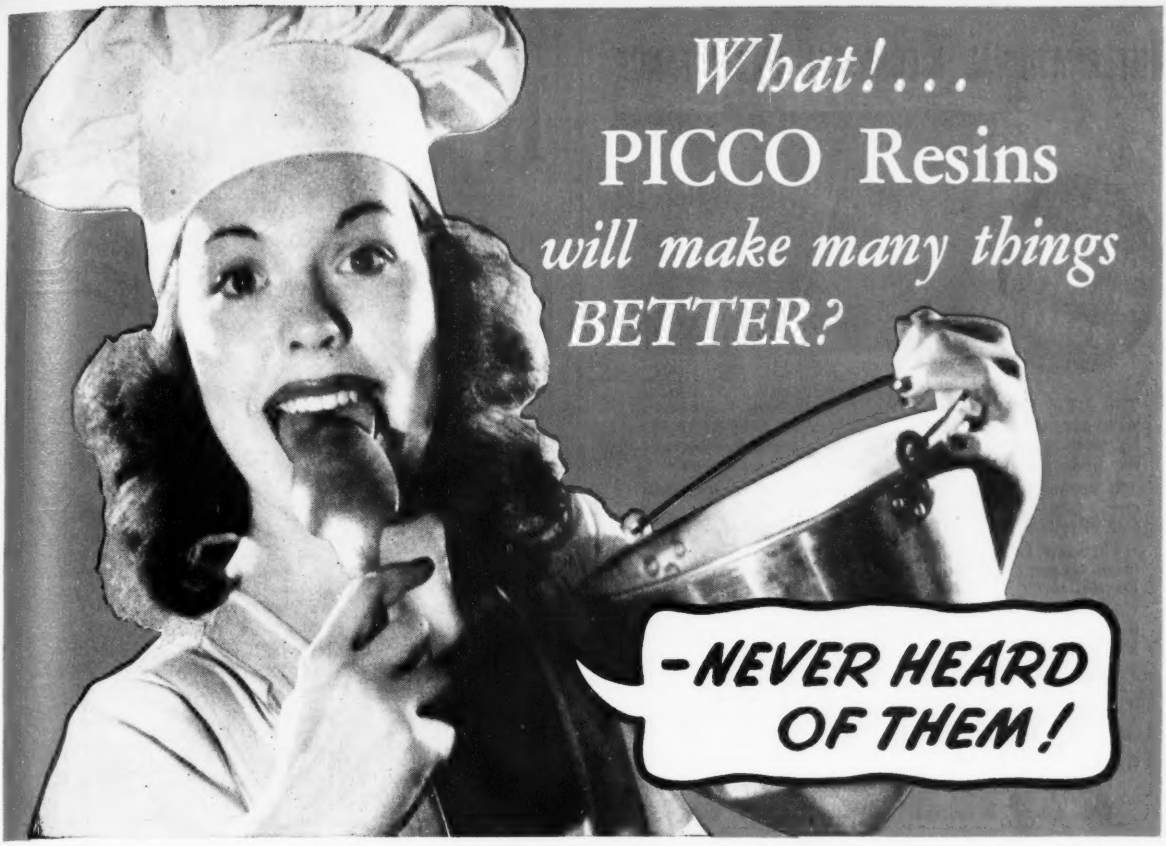
3. Blowdown control of condensate removal assures uniform platen temperatures by eliminating pockets of air and water.

4. Taylor Recording Controllers give you a complete record of the number of cures run per day, as well as the temperature, time and force exerted during each cure. This is a valuable aid both in planning products and in evaluating down time.

There's a Taylor Control System for every phase of the rubber industry. For more information on what Taylor Controls can do for your operation, see your Taylor Field Engineer, or write Taylor Instrument Companies, Rochester, N.Y., or Toronto, Ontario.

Taylor Instruments
MEAN
ACCURACY FIRST

VISION · INGENUITY · DEPENDABILITY



But we are talking about OTHER KINDS OF MIXES-

For Instance in such applications as: In general rubber compounding for plasticizing, extending, tackifying and stiffening; or in softening compounds for drug sundries and toys; or for soles and heels, floor tile, belting and gaskets . . . And in many other applications of laminating, sizings for textiles and leather, impregnating, insulating, adhesive making, coating . . .

PICCOUMARON

Para Coumarone Indenes

Neutral inert synthetic resins that promote good aging, good flexing, high tear resistance.

PICCOLYTE

Pure Hydrocarbon Terpenes

Thermoplastic synthetic resins having the same carbon to hydrogen ratio as plantation rubber. Chemically inert, non-toxic.

PICCOLASTIC

Styrene & Modified Styrenes

Thermoplastic, light colored synthetic resins completely soluble in aromatic hydrocarbons.

PICCOPALE

A Basic Raw Material

Low-cost thermoplastic synthetic resins that can serve as a basic raw material for many applications.

RESINEX

Liquid, Flake or Solid

A versatile aromatic resin of a thousand uses—in GR-S, natural, reclaim, neoprene, vinyls and other thermoplastics.

Write for complete technical data on resins
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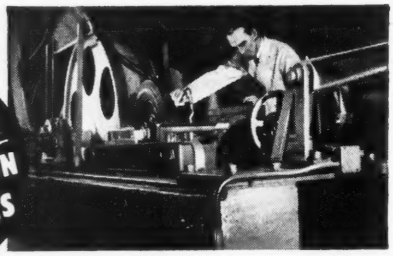

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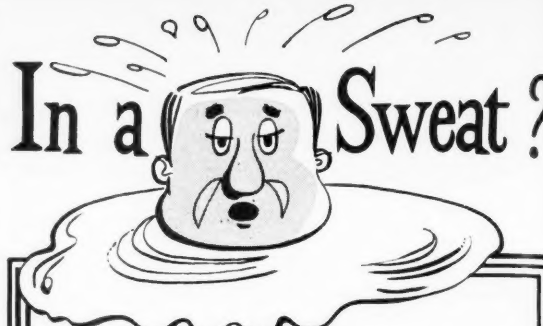

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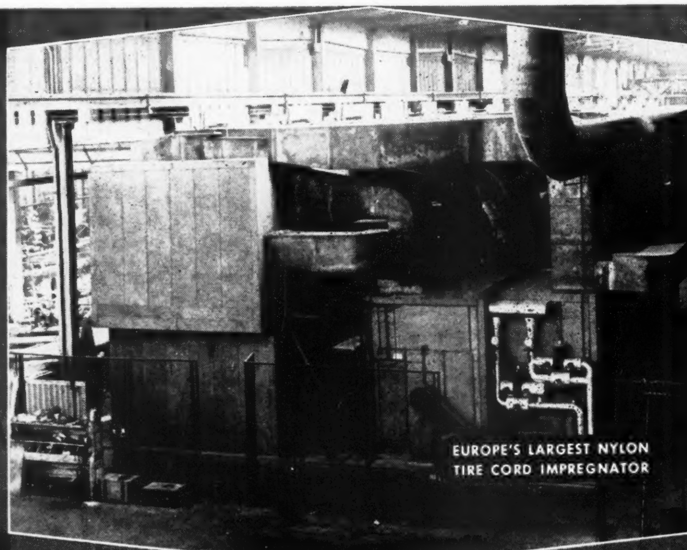

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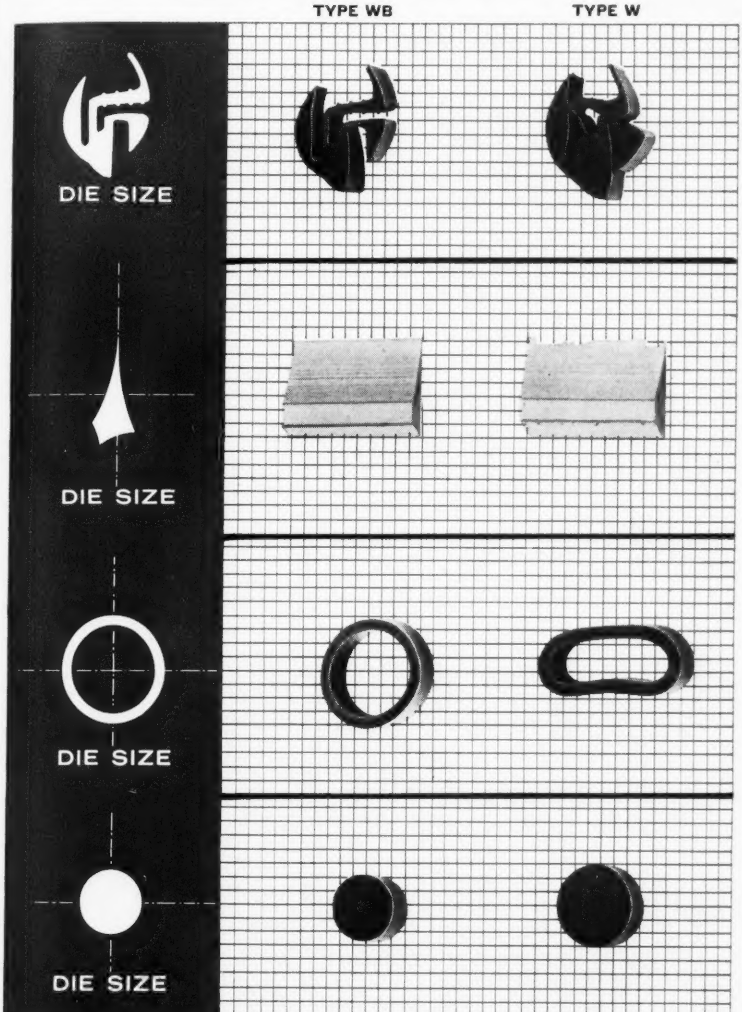
NEW...from Du Pont

NEOPRENE TYPE WB

Compare the photographs below. They illustrate some of the marked processing improvements offered by this new "nerve free" elastomer*

TYPE WB TYPE W



NO FUSING is encountered when Type WB is extruded from complicated dies. Notice the striking difference between the Type WB channel strip and the Type W extrusion that has fused at three points.

SHARP FEATHER EDGE obtainable with Type WB is illustrated by this Garvey extrusion. Note also the smooth surface and absence of "waviness" (nerve) in this sample. This is true even in non-black, low durometer compounds.

NO COLLAPSE is evidenced by Type WB tubing after open steam cure. Compare the two photographs. The extent of collapse displayed by the Type W tube is characteristic of most other elastomers.

EXTREMELY LOW DIE SWELL is best shown by these solid rod extrusions. Swell of the Type WB extrusion is negligible when compared with the swell of Type W and other elastomers.

These are just a few of the improved processing characteristics of Neoprene Type WB. Complete technical information has just been released in Report 58-8. If you have not received your copy, contact the District Office nearest you.

**For direct comparison, all samples were compounded alike; the only difference was in the elastomer used. All samples illustrated were cured in open steam.*

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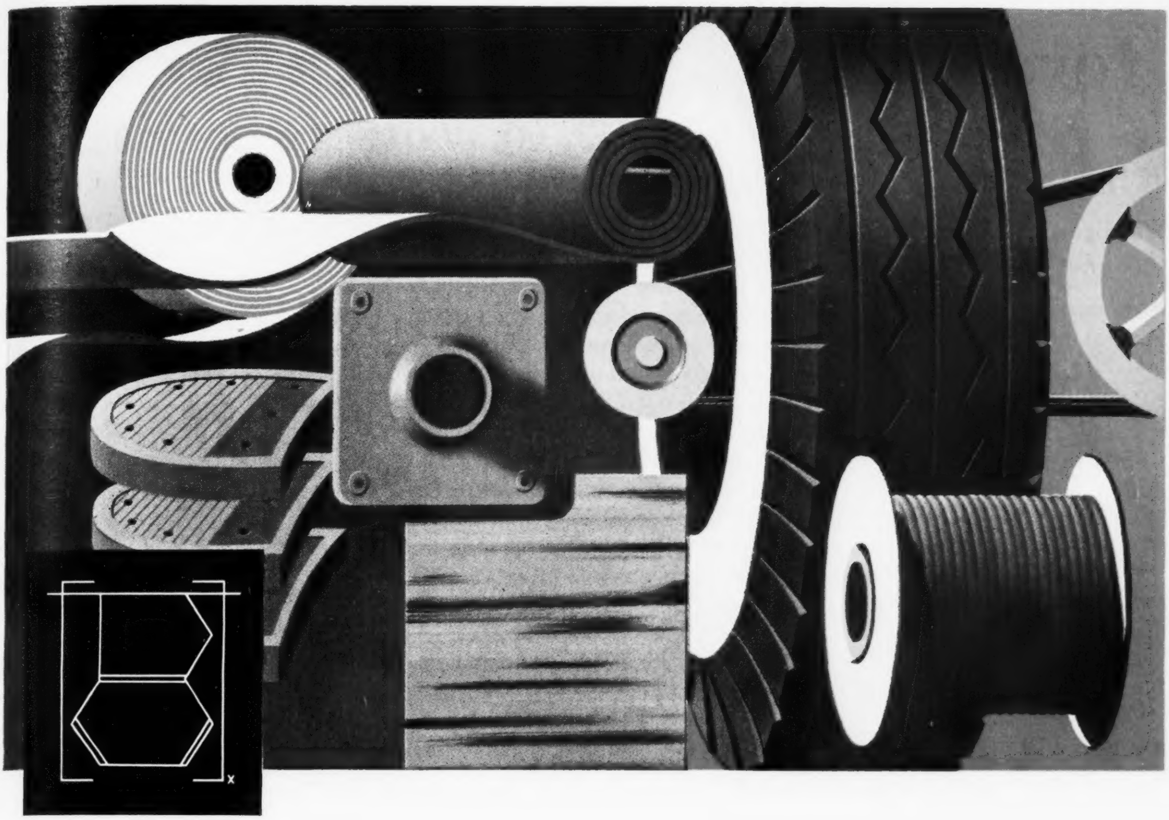

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Here's how UOP 88® and

. . . to protect your rubber

What you need to know about antiozonants today

When UOP 88 or UOP 288 is compounded into your rubber products, deterioration of the polymer by exposure to ozone is prevented by action of the UOP chemical antiozonant which continually migrates to the surface of the rubber article and there acts as a sacrificial ozone scavenger.

That's nutshelling it for you. Behind this simplification of how UOP 88 and 288 work is a vast network of factors to be taken into consideration. How long and how well the antiozonants will work for you depend on a knowledge of the differences in antiozonants and the factors involved in compounding.

Knowing the difference

Antiozonants vary widely in type and composition. One material may give quite satisfactory protection under static conditions but fail miserably under even modest flexing. Another will provide mediocre protection in static or dynamic service. UOP 88 and 288 however provide excellent ozone protection to rubber goods in storage and in use.

Proper application is almost as important as antiozonant selection. A windshield wiper blade formulation, tire compound or gasketing recipe will differ—sometimes widely—in composition; the service conditions of the finished article are equally diverse. In making recommendations for ozone protection all these factors must be evaluated. The conditions of use and service are of utmost importance in selecting the amount and means of antiozonant protection.

At Universal Oil Products Company some of the country's most able research scientists and technicians work constantly testing and improving the UOP family of antiozonants.

What influences effectiveness

Effectiveness of antiozonant compounds may be influenced by these major factors:

1. Type of polymer, natural or synthetic
2. Curing system used
3. Reinforcing agent used
4. Concentration of the compounding ingredients, including the antiozonant
5. Conditions under which the product is to be used, including:
   a. type of stress encountered (fixed or intermittent)
   b. ozone concentration
   c. temperatures

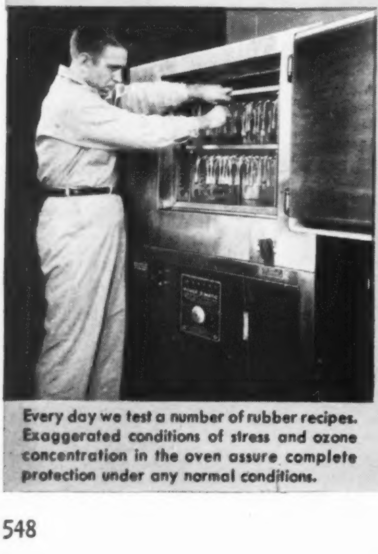
When the product is to be vulcanized, the choice of curing system is the most important single factor in obtaining maximum antiozonant performance. The formulation being used must be suited to the curing system or much of the antiozonant's protective action will be lost in vulcanization.

The type and concentration of carbon black used as a reinforcing agent also plays an important part in retention of antiozonant efficiency through the vulcanization phase.

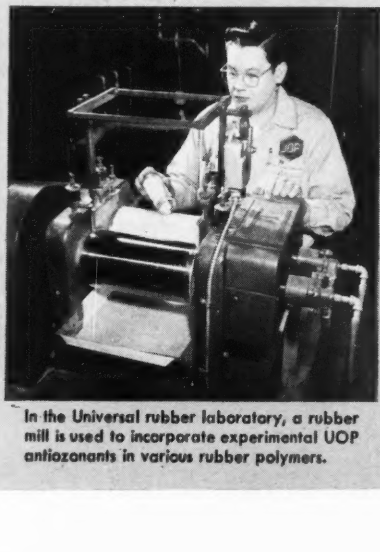
The concentration levels of the antiozonant must be related to other ingredients of the compounding recipe and to exposure conditions. Variations in type or concentration of ingredients reduce or enhance the final, lasting effectiveness of the antiozonant.

So you already use an antiozonant

Like most rubber goods manufacturers, you probably include some



Every day we test a number of rubber recipes. Exaggerated conditions of stress and ozone concentration in the oven assure complete protection under any normal conditions.



In the Universal rubber laboratory, a rubber mill is used to incorporate experimental UOP antiozonants in various rubber polymers.

The Scott Tester is used to measure physical properties of an experimental vulcanizate.

288® work
products

kind of antiozonant compound in your product formula. What you may not know, however, is that the ozone damage problem is becoming progressively more acute and not all antiozonant compounds can cope with the increasing ozone levels. What served as effective antiozonant protection even a few years ago is inadequate today. Reported instances of deterioration of rubber goods due to ozone attack are often quite dramatic. In the Los Angeles area, where the ozone concentration is high, an unprotected rubber article may actually show ozone damage in a few days. In other large cities where ozone levels are not so high, ordinary base stocks may crack in a year or less even under static conditions.

UOP researchers have worked unceasingly and successfully to keep UOP 88 and UOP 288 compounds up to the demand placed on the antiozonant for utmost protection against this spiralling ozone load.

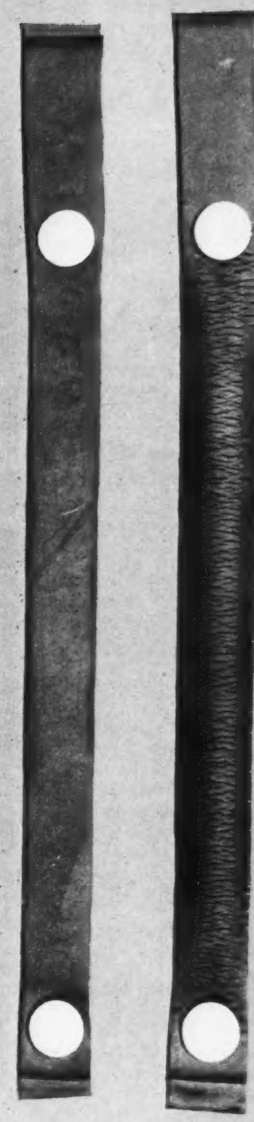
Here's proof

The UOP research laboratories are the scene of a daily battle against ozone. Through continuous research and arduous testing of thousands of antiozonant formulations in a variety of base stocks, you may be assured of absolute protection of your products when you use UOP 88 or UOP 288. In addition, many manufacturers have tested UOP antiozonants in their own laboratories and in use, have proved them to be superior. One of our tire customers recently reported that in a test of UOP 88 in their base stock, the UOP antiozonant afforded complete protection for 230 hours of exposure under fixed conditions of strain at 50 pphm ozone . . . much greater strain and ozone concentration than the tire would ever be subjected to in normal use. Comparatively, another antiozonant, used in the same recipe, failed and the tire cracked after only 30 hours of exposure. As a further basis of comparison, the unprotected base stock cracked in 5 hours.

How about your product?

You will get surer, more lasting protection of your rubber products with UOP 88 or UOP 288. For one little penny per pound of base stock these UOP antiozonants will perform for years to prevent ozone cracking, even under severe atmospheric exposure.

All UOP facilities and technical personnel are at your disposal for counseling on your particular antiozonant needs. A phone call, letter or wire will put them to work for you right away.



Rubber Strip Tests Show Effectiveness of UOP Antiozonants

The two rubber strips above were inserted in an ozone cabinet under identical, controlled conditions. The rubber in the sample shown on the right did not contain an antiozonant and reveals marked ozone damage. The SBR sample on the left contains two parts phr of a UOP antiozonant and reveals no ozone cracking after equal exposure.

UOP 88® and 288®

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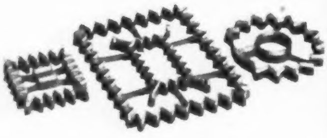

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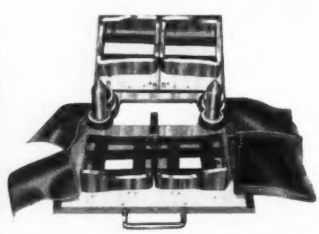

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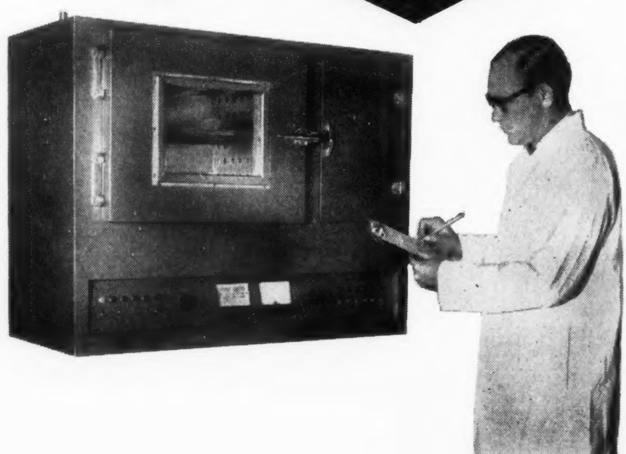

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After many months of actual commercial production... production of millions of pounds... Texas-U.S. Chemical Company announces the commercial availability of mechanically mixed, ultra-dispersed black masterbatches.

Unlike previous masterbatches in which the carbon black is dispersed by use of surface-active agents, the new TEXUS Black SYNPOLS are produced by an extremely effective *mechanical* mixing process, which achieves better Black dispersion and a stronger carbon-polymer bond. *No* dispersing agents, coagulating salts or other foreign materials, which detract from masterbatch physical properties, are introduced.

Commercially Proved

Perfected and produced on full-scale plant production lines, the new Black SYNPOLS assure rubber processors all the advantages of a *commercially proved* product. These new Black SYNPOLS can be adopted for product manufacture with confidence in their uniformity and adherence to commercial production specifications. This eliminates all the costly uncertainties of working with materials produced in pilot-scale operations.

In addition to the long sought-for advantages which may be realized by the reduction of carbon black agglomerates—such as improved tread life due to less tread cracking and higher physical properties,

TEXUS Black SYNPOLS offer . . .

IMPROVED RUBBER-CARBON BOND—by eliminating dispersing agents and coagulating salts.

MIXING ECONOMIES – lower power consumption and shorter mix cycles.

PREMIUM QUALITY – low ash content equivalent to premium rubbers.

UNIFORMITY – fully proved production process assures the uniformity of quality found in all TEXUS SYNPOLS.

Experimental tires based on the new SYNPOL masterbatches were first produced last year and have been undergoing severe service tests since that time. Results to date have been so significant that millions of pounds of the new Black SYNPOLS have already been used in *commercial* tire production.

Learn first hand the important advantages these new SYNPOL masterbatches offer. Your local TEXUS representative can give you full information and arrange for *immediate* delivery of your needs, from samples to full carload quantities. Call him today, or write to Naugatuck Chemical, Naugatuck, Conn.—SYNPOL Sales Agent.

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SYNPOL BLACK MASTERBATCHES NOW AVAILABLE

	Rubber	Black	Oil
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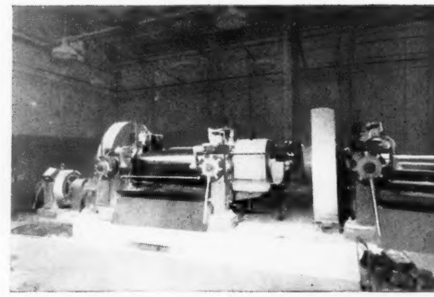

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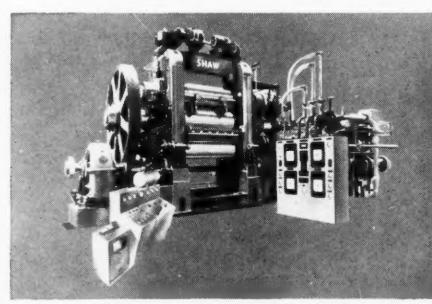
Francis Shaw are available for the design, manufacture and installation of a wide range of processing equipment



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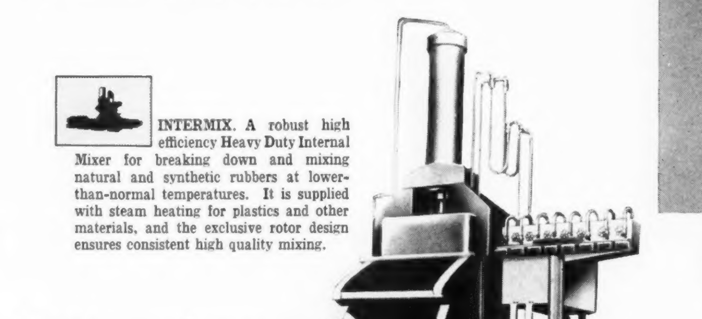

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P1136

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This is typical of Roebling's advanced packaging methods—that makes handling Roebling high-quality wire so much easier. For details on this efficient Roebling Tire Bead Wire packaging method, or information on other types of Roebling wire, write Wire and Cold Rolled Steel Products Division, John A. Roebling's Sons Corporation, Trenton 2, New Jersey.

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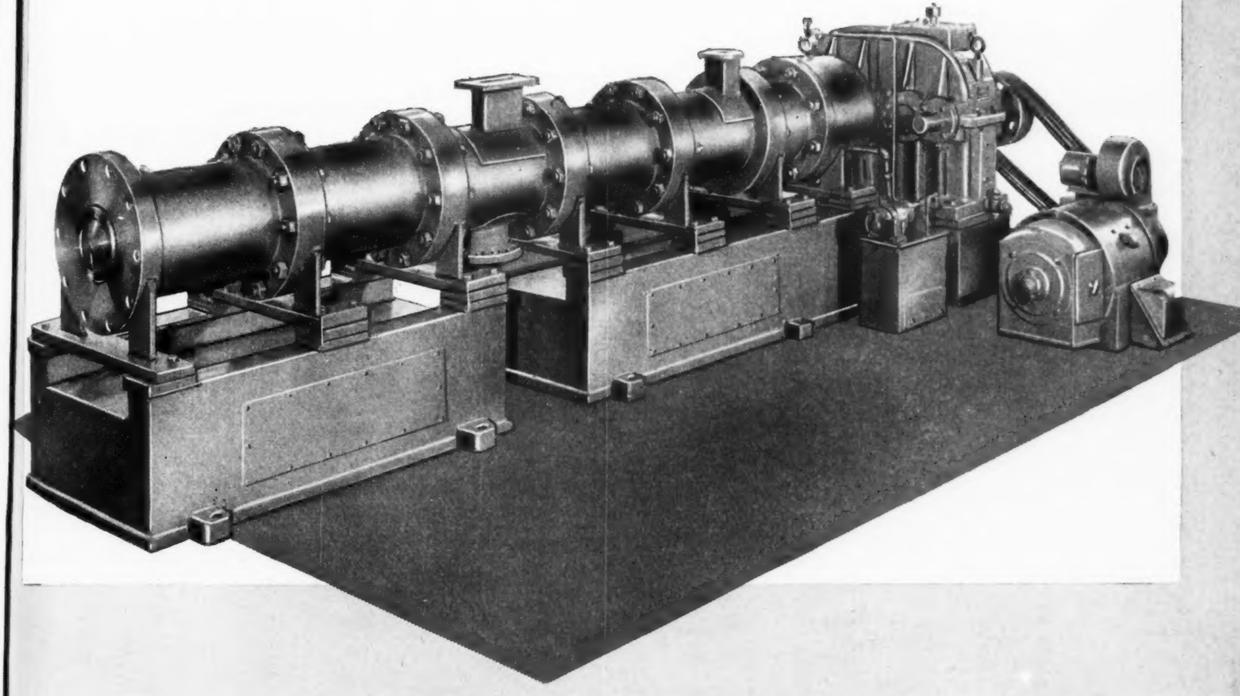

The 8" extruder illustrated fits into a special processing line. Custom designed for a large chemical company, the extruder had to be designed to coordinate with existing processing, blending and mixing facilities.

Extruders for standard operations can be off-the-shelf models but new processes, new products, new ideas require specific designs. For example, in the processing of polyethylene, we developed special extruders for simultaneous hot and cold feeding. In the fields of foamed plastics, polystyrene, polyethylene, the vinyls, we have designed many individual extruders for processing, blending, reclaiming and devolatilizing.

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If you are working on new ideas in either plastics or rubber, H & K can be of assistance. We have specialized knowledge of these fields and can design a complete plant, a special process or an individual machine. We also have complete engineering service.

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SWEDISH RUBBER HANDBOOK

2nd Edition

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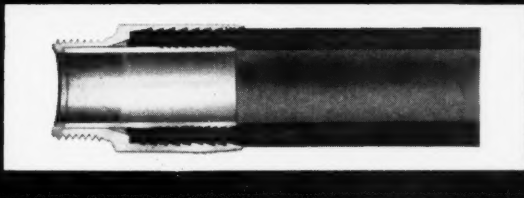

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RUBBER WORLD
EDITORIAL

SBR Numbering System Problems

WHEN the government styrene-butadiene rubber plants were disposed of to private industry in early 1955, the broad system of classification, standardization, and specification for this type of rubber, as practised under government control, ceased to exist as such. With a dozen or more producers replacing in effect one producer, it was felt that the 50 or more SBR's, rather well defined by previous cooperative efforts under government supervision, should retain some measure of the former classification and standardization on a voluntary industry basis. The American Society for Testing Materials offered its services in this connection, and they were accepted by the SBR producers.

Subcommittee 13 on Synthetic Elastomers of ASTM Committee D-11 was established in 1955 for the purpose of continuing this classification and standardization of SBR on a voluntary basis. In June, 1956, Tentative Recommended Practices for Description of Styrene-Butadiene Rubbers, ASTM D 1419-56T; For Description of Types of Styrene-Butadiene Rubber and Butadiene Rubber Latices, ASTM D 1420-56T; and For Nomenclature for Synthetic Elastomers and Latices, ASTM D 1418-56T, were established.

ASTM D 1419-56T and D 1420-56T involved the continuation of the use of the former GR-S numbers and the assigning of new numbers as required, and a system for assigning these new numbers was worked out early in 1957 by subcommitte 13. New numbers, such as SBR 1506, for a low-viscosity, alum coagulated, cold rubber, described elsewhere in this issue, are requested of subcommittee 13 by the producer under the present system and then, when these numbers are approved, are publicized in the trade journals and added to the listing in ASTM D 1419 or 1420. There is also a provision for numbers for use with experimental polymers by which each of the several producers has his own group of numbers in the 3,000 to 10,000 range.

It has come to our attention that apparently all producers are not at all times availing themselves of the system of assignment of numbers for commercial polymers through subcommittee 13 of ASTM Committee D-11, nor are they availing themselves of the numbers for experimental polymers assigned to them. As part of a survey made by RUBBER WORLD for an article on "The Future of Commercial Synthetic Rubbers," which appears in this issue, several producers reported SBR numbers that did not seem to be in accordance with the ASTM system. For example, Firestone Tire & Rubber Co. has a FR-S 123, said to be an ASTM 1700 class rubber; Goodrich-Gulf Chemicals, Inc., has a 2000 X99, said to be an oil-extended SBR; and Copolymer Rubber & Chemical Corp. has a Copo X-800 SBR latex. None of these numbers fits into the ASTM system for either commercial or experimental polymers.

A properly classified listing of SBR's is important to the producing and consuming industry. To date the ASTM system is the only available means of providing a reasonable degree of order in this listing, and if the producers are reluctant to follow this system at all times, considerable difficulty will develop in the marketplace.

We urge all SBR producers to review their grade listings in light of the ASTM practices and follow more closely the system for assigning both commercial and experimental numbers.

R. G. Seaman
EDITOR

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Airsprings and Their Application to Automotive, Aircraft, and Industrial Uses[1]

By H. H. DEIST

Firestone Tire & Rubber Co., Akron, O.

IN THE early 1930's the automotive industry found itself under heavy pressure to improve the riding qualities of its passenger vehicles. Higher speeds, longer trips, and improvements in other phases of automobile design and construction served to focus attention upon needed suspension improvements.

For many years engineers had been interested in the possibilities of using rubber springs in place of metal springs. Soft suspensions, however, generally require a long travel or stroke, and the inherent inelasticity of rubber seemed to make this impractical, except with torsion bushings using long lever arms. In turn, the long lever arms greatly magnified minor variations between bushings, and the problems of thermal change and permanent set.

Still another difficulty was the dynamic stiffness of rubber which is much greater than indicated by static deflections. This means that rubber moves less when it receives a quick blow than it does when the same force is applied slowly. For an automobile suspension, this quality is not desirable.

None of these limitations applied to air as a load-carrying medium, thus the development of an "airspring" seemed to offer great possibilities. Firestone

[1]Presented before Rubber & Plastics Division, ASME, New York, N. Y., Dec. 4, 1957.

The Author

H. H. Deist

H. H. Deist, assistant manager, engineering laboratories, Firestone Tire & Rubber Co., received his bachelor's degree in mechanical engineering from the University of Akron in 1940 and his M.S. in physics from the same university in 1949. He started with Firestone as a cooperative engineering student in 1937, became a full-time employe in the engineering laboratory in 1940, a project engineer in 1945, and a supervisor of machine design in 1949. He has held his present position since 1955.

In 1954, Mr. Deist was sent to Firestone's guided missile division in California where he worked on mechanical production and reliability problems on the Corporal missile. He returned to Akron in 1955. He has spent a considerable part of his time on airspring development since 1947 and more recently in the development of airspring production equipment.

Mr. Deist is a member of the American Society of Mechanical Engineers, the Society of Automotive Engineers, and the Ohio Society of Professional Engineers.

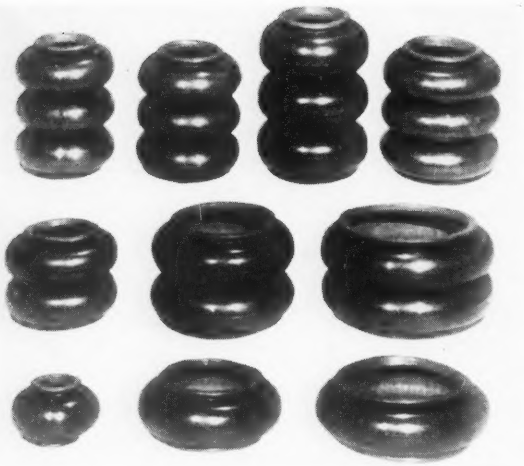


Fig. 1. Single, double, and triple convolution airspring bellows of various sizes

entered into this development. The original concept was to enclose the load-carrying column of air in a rubber-and-fabric container following tire construction principles wherever possible. The fabric provided the strength to hold the air pressure, and the rubber served to make the container impervious to air leakage and to provide a protective outer covering. Wire beads were incorporated in the ends to provide strong attachment means. To provide for the necessary stroke, the container was shaped in the form of a bellows or convolution. One, two, three, or more convolutions were provided, depending upon the stroke required.

Airspring bellows of various diameters and number of convolutions are shown in Figure 1. Even though this form is an early one of the airspring, it is by no means obsolete, and there are many practical present-day applications for airsprings of this type.

Early Developments

The initial emphasis was on passenger-car suspensions, and by 1935 experimental Buick (Figure 2) and Plymouth cars equipped with airspring suspensions were demonstrated in Akron, Detroit, and elsewhere. Within several years additional successful installations were made on Buick, Stout, Studebaker, Chrysler, Cord, LaSalle, Lincoln, and Checker Cab automobiles.

The airspring was not adopted in the Thirties, apparently because styling at that time was such that the levelizing feature of the airspring suspension was of no great importance, and there was room for a tremendous amount of improvement in steel spring suspensions at a lower cost. So the industry went the way of the independent front end, coil springs, longer wheel base, larger section and lower pressure tires, and foam rubber seats to improve the riding quality of its cars.

Later Developments

Firestone continued with airspring development work, and applications were made in other fields. Aircraft landing gears were developed, and a Sundorph cabin monoplane equipped with an airspring gear was flown in the 1937 Bendix race. Later landing gears were made for Wright Air Development Center, Stinson, Scott, Sikorsky, the Navy, the PT-19 (Figure 3), the N2T-1, and others. Applications were made also for shock and vibration isolators, pneumatic instruments, seat suspensions, valve operators, air brakes, gearshift vacuum boosters, welding machine actuators, tire-building machine stitchers, and load cells. Trailer applications were made for Reynolds, Kuester, and Fairchild. In all, some 50 experimental airspring suspensions were installed on industrial trailers, railroad cars, motor coaches, passenger cars, and military vehicles.

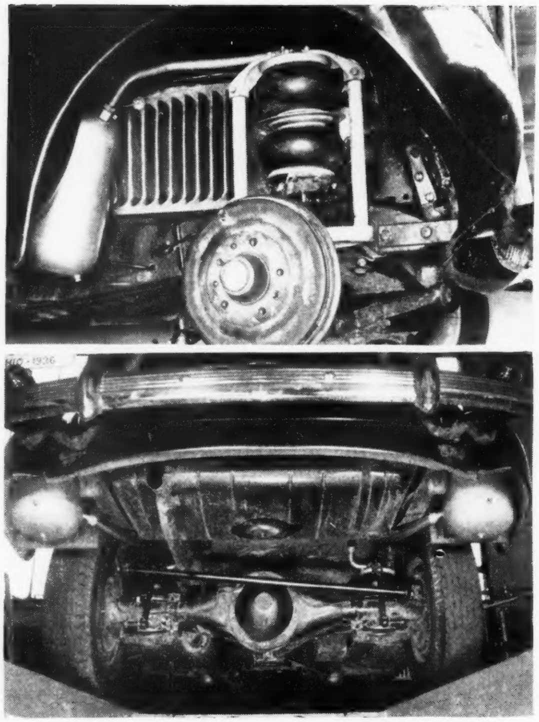


Fig. 2. Early airspring application on 1935 Buick automobile. Top photo shows independent-wheel, transverse-parallelogram type on front end. Bottom photo shows rear suspension of the torque-tube-drive type with transverse track rod

The first rail-car installation was made on a Pullman car in 1947. Since that time, several complete trains, such as the General Motors Aerotrain, the Pullman Standard Train X, and the Budd Pioneer III have been placed in operation.[2]

In 1949 airspring-suspension jet-engine containers, Figure 4, were manufactured in large quantities for the J-33, J-34, J-40, and J-47 engines. This application was a unique one utilizing a small bellows inside of a larger one. The larger bellows, operating on air, handled the ordinary vibrations encountered during transportation. The smaller inner bellows filled with oil absorbed heavy transient-shock loads.

[2] *Mech. Eng.*, Feb., 1957, p. 140

Airsprings and Their Automotive, Aircraft, and Industrial Uses

The development of airsprings as a replacement for the steel spring suspension system of automobiles began in the 1930's, but since there was room for a tremendous amount of improvement possible in steel spring suspensions at a lower cost, the airspring was not adopted in the 1930's. About 50 experimental airspring suspensions were installed, however, on industrial truck trailers, railroad cars, motor coaches, passenger cars, and military vehicles.

The first rail car installation was made in 1947, and since that time several complete trains with air suspension systems have been placed in operation. Airspring suspensions for the General Motors Coach went into production in 1953, and more than 400 million miles of operating experience have been accumulated with this application.

The airspring, as applied to automotive and railcar suspensions, has the following principal features: (1) It makes possible a levelizing system which keeps the vehicle at constant standing height from the roadway regardless of load. (2) The airspring makes possible a suspension having very nearly the same performance in terms of softness or natural frequency regardless of load. (3) The airspring suspension can be made to approach the ideal spring curve, that is, one that is soft in the region where it is normally used and then becomes progressively stiffer as it is compressed or extended.

Natural frequency for a spring-mass system is inversely proportional to the square root of the static deflection. The performance of a suspension, insofar as riding comfort is concerned, is generally measured in terms of natural frequency in cycles per minute or spring rate in pounds per inch of spring deflection. With the levelizing airspring suspension, static deflection remains nearly the same for all load conditions, and natural frequency remains almost constant. The airspring approaches the ideal performance of a spring of a given stroke in that it is able to provide as soft (low frequency) as desired a rate in the range of stroke used most of the time and still be able to absorb maximum energy in compression without bottoming.

The performance characteristics of an airspring are determined by the expansion and compression of air as the bellows extends or compresses and the change in effective area throughout the total stroke. The airspring has a different equivalent static deflection and, therefore, a different natural frequency for each position of the stroke. This means that no resonant forced frequency can cause a large amplitude build-up. Thus the airspring has a form of non-energy-consuming damping.

As airsprings are presently being incorporated into conventional suspension designs, there is considerable activity under way to design new and novel suspensions around them in such a way that their advantages can be exploited to the fullest extent.

In 1938, General Motors Coach became interested in developing a new suspension for its buses. The first buses were road tested in 1944 and went into production in 1953. General Motors Coach now has more than 400,000,000 miles of operating experience with airspring suspensions, and many of these individual airspring assemblies, Figure 5, have run more than ¾-million miles without failure. In addition to improving the ride, the airspring has reduced suspension maintenance to the point where many bus operators no longer bother to keep records of it. Chassis and body maintenance also have been reduced.

Two or three years ago a passenger-car ride frequency of 60 to 70 cpm. was considered venturesome. In today's planning, this range has become 40 to 55 cpm. Within the limitations of wheel-housing space, such soft suspensions can be obtained only by the use of non-linear springs such as the airspring.

General Principles

The airspring, as applied to automotive and rail-car suspensions, has three principal features:

(1) It makes possible a levelizing system which keeps the vehicle at a constant standing height from the roadway regardless of load. This maintains road clearances when the vehicle is heavily loaded and requires that less wheel travel and wheel-housing clearance be provided.

(2) The airspring makes possible a suspension having very nearly the same performance in terms of softness or natural frequency regardless of load. A vehicle will ride the same when it is lightly loaded as when it is heavily loaded and, of course, at the same height or level.

(3) Owing to its non-linear characteristics, the airspring suspension can be made to approach the ideal spring curve, that is, one that is very soft in the region where it is normally used, and then becomes progressively stiffer as it is compressed (jounce) or extended (rebound). There are other important advantages such as light weight, small size, less noise transmission, lateral stiffness, long life, and the possibility of raising the automobile body height when traveling on deeply rutted

Fig. 3. Airspring landing gear on PT-19 aircraft

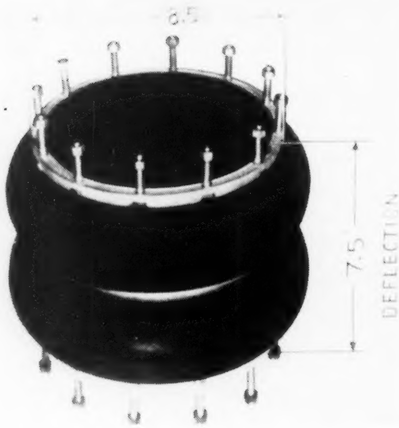


Fig. 5. Individual airspring used on General Motors coach. This unit weighs five pounds and will carry 7,000 pounds

roads. However, the three principal advantages will be discussed in greater detail.

Levelizing

The elementary airspring-suspension system, Figure 6, consists of an air compressor, which may be driven from the vehicle engine or by an electric motor, a central air-supply tank, levelizing valves, reservoirs, airspring bellows, and connecting piping. The compressor and central reservoir are operated at a pressure higher than the pressure required for the airsprings under maximum load.

Levelizing valves may be supplied for each wheel, or for each wheel in the rear with a single valve for the front end, or for each wheel in the front with a single valve for the rear end, or one valve for the front end and one valve for the rear end, or with a single valve for the entire vehicle. In any event, the function of the levelizing valve is to admit additional air to the bellows when the car body is lowered because of increased load, and to vent excess air from the bellows when the car body moves up because of unloading. The levelizing valves force the body to remain at a fixed height regardless of load or distribution of load.

The levelizing valves are intended to be static controls; that is, they adjust the body height only when the load is changed and remain unaffected by dynamic forces caused by bumps in the road, curves, turns, and other maneuvers of the vehicle.

It is desirable to level the car body to within ¼-inch, and the valves must therefore be very sensitive, with only a small dead zone. Rate of air flow is generally made to increase as the valve lever is displaced further. Sometimes this is a two-step arrangement.

Frequency Independent of Load

Natural frequency for a spring-mass system is inversely proportional to the square root of the static deflection and for systems of negligible damping and one degree of freedom is given by the following equation:

$$\text{natural frequency (cpm.)} = \frac{188}{\sqrt{\text{static deflection, in.}}}$$

The performance of a suspension, insofar as riding comfort is concerned, is generally measured in terms of natural frequency in cycles per minute (cpm.) or in spring rate in pounds per inch of spring deflection. For linear springs such as coil or leaf springs, the spring rate is constant throughout the stroke, and a single number describes the spring. For non-linear springs such as airsprings, the spring rate changes throughout the stroke, and both rate and position must be specified.

Fig. 4. Airspring suspension of pressurized jet engine enclosure to prevent damage during handling and transportation

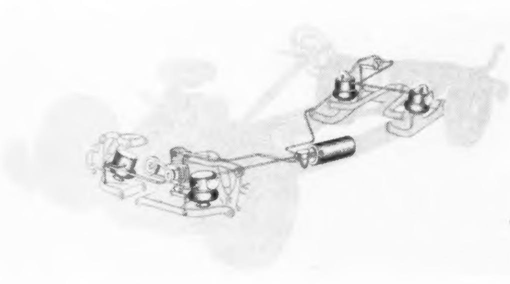


Fig. 6. Elementary air-suspension system for automotive use

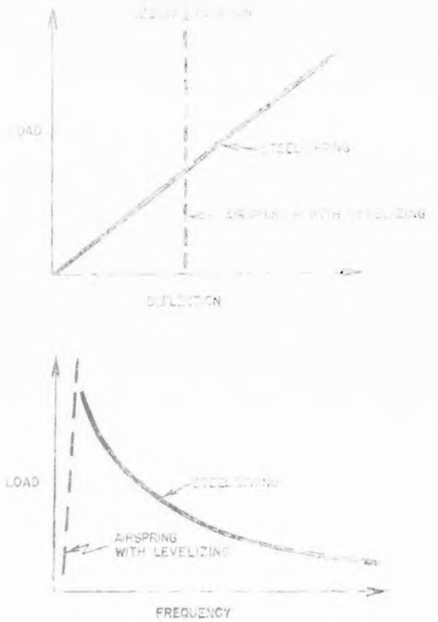


Fig. 7. Steel spring characteristics compared to airspring characteristics. Load *versus* deflection (top) and load *versus* frequency (bottom)

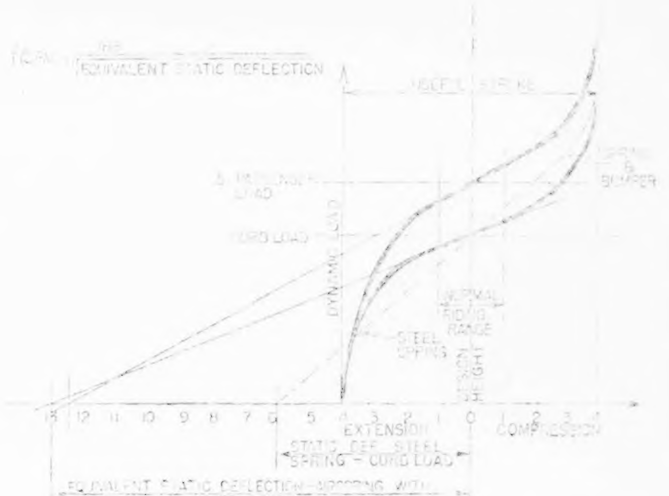


Fig. 8. Dynamic load-deflection characteristics of airspring compared with steel spring

This information is usually presented in the form of a curve. With a linear-spring system, the static deflation increases with load; therefore the suspension is very fast when the vehicle is lightly loaded and becomes slower (softer) when the load is increased. If the static deflection remains nearly the same for all load conditions, it follows that the natural frequency remains almost constant, and this is the case with the levelizing airspring suspension, Figure 7.

Ideal Performance

The ideal performance for a spring of given stroke is to provide as soft (low frequency) as desirable a rate in the range of stroke used most of the time and still be able to absorb maximum energy in compression (jounce) without bottoming.

The comparative performance of linear steel springs and optimum design airsprings is shown in Figure 8. Here the airspring and steel spring are shown as hav-

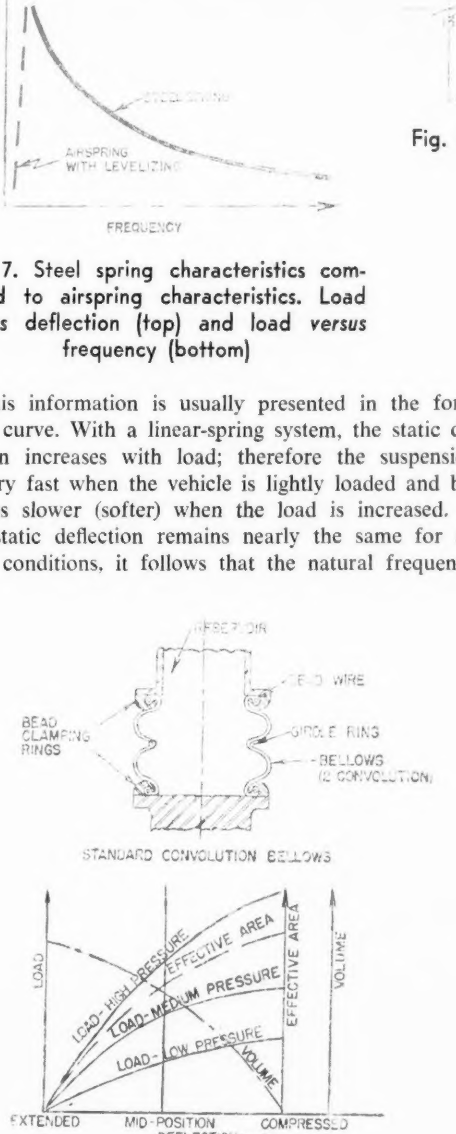


Fig. 9. Dynamic performance characteristics (bottom) of standard convolution airspring bellows having equal bead diameters (top)

TABLE 1. TABULATION SHOWING SCOPE OF SIZES & TYPES

1. Type	single convolution	double convolution	triple convolution	1X & 2X
2. Maximum recommended air pressure at mid-position for 2-ply construction, psi.	75	75	75	100
3. Maximum stroke,* in.	4	9	12	12
4. Minimum effective area at mid-position, in.^{2}	14	15	18	6
5. Maximum effective area at mid-position, in.^{2}	276	160	160	140
6. Rated load at mid-position, maximum size, lbs.	20,800	12,000	12,000	14,000
7. Rated load at mid-position, minimum size, lbs.	1,050	1,125	1,350	1,700

*Maximum stroke not available in all sizes of each type. Additional sizes, particularly larger sizes, are possible in all type. Air pressures and loads may be increased by using 4-ply construction and by restricting the increased loads to the compressed bellows positions.

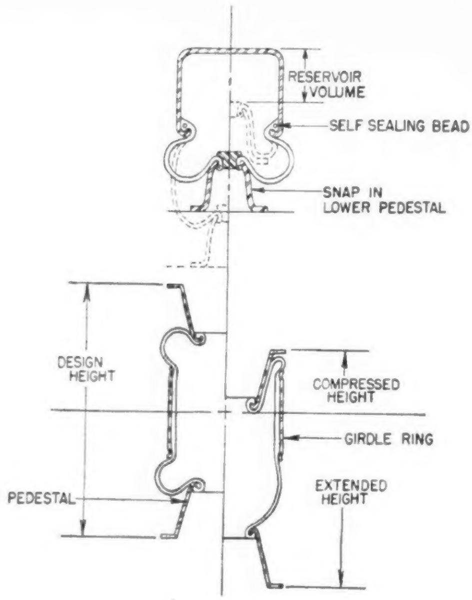


Fig. 10. Diagrams of single convolution IX type bellows (top) and double convolution 2X type (bottom) airsprings

ing the same useful stroke and same design load and design height. The static deflection of the steel spring, however, varies from six inches for curb load to eight inches for five-passenger load.

The levelizing airspring maintains nearly the same static deflection for any load, and by utilizing the flat portion of the curve for the normal ride range, a very large equivalent static deflection is obtained and, therefore, a ride of lower frequency. Thus the airspring provides a ride in the normally used portion that is equivalent to that which would be produced by a linear spring having an actual stroke several times longer. Such a coil or leaf spring would, of course, be impractical. While the airspring is soft in the normally used portion, it becomes progressively stiffer when compressed, thus absorbing normal jounce energy without permitting the car body to strike through to the bump stops. The shape of the airspring curve can be tailored to meet various requirements.

Types of Airsprings

There exists a wide variety of shapes and types of airsprings within the generic category. Table 1 shows the range of size, stroke, and load characteristics available with the following three types of Firestone airsprings:

Standard Convolution Bellows Type

This standard convolution bellows type, Figures 1 and 5, may have one, two, or three convolutions. It has the characteristics that the effective area increases from zero at maximum extension to a maximum at full compression, while the volume decreases from maximum at maximum extension to minimum at full compression. Typical dynamic performance curves are shown in Figure 9.

Single Convolution, Unequal Bead Diameters (IX)

This single convolution type, shown in Figures 10 and 11, lends itself to low frequencies with minimum reservoir size since the bellows has a small volume, yet permits a long stroke. In addition, the effective area can be made to decrease with compression to offset the influence of increasing air pressure. The degree of change in effective area can be controlled by the shape of the lower attachment or pedestal. Several of these shapes are illustrated in Figure 12. Complete freedom in choosing a pedestal shape is limited by flexing life and stability considerations.

Double Convolution, Beads Smaller Than Girdle Ring (2X)

This bellows, which is shown also in Figures 10 and 11, is basically similar to the IX type but permits even longer strokes. Figure 13 illustrates typical dynamic performance curves for the IX and 2X types.

Airspring Theory

The performance characteristics of an airspring are detemined by two factors. The first is the expansion and compression of air as the bellows extends or compresses, and the second is the change in effective area throughout the total stroke. Since rubber is a good thermal insulator, the dynamic expansion and compression of the air is essentially adiabatic. The change in effective area is inherent in the design of the various types of airspring bellows. A few definitions and some nomenclature are necessary before proceeding further.

Bellows Volume. This is the internal volume of the bellows, exclusive of its reservoir, if any. This volume varies with stroke, being maximum for maximum bellows extension and decreasing to minimum at full compression. It is most useful to plot a curve of the bellows volume *versus* bellows stroke, Figure 13. If possible, this information should be obtained from actual test measurements. If the bellows is not avail-

Fig. 11. Type IX and 2X airsprings suitable for light and medium-weight vehicles

able, however, volumes can be computed from dimensions scaled from design layouts.

Reservoir Volume. This is the volume external to the bellows when the bellows is in the fully compressed position.

Effective Area. The effective area is the load-carrying area of the bellows. It varies with the stroke, being zero at maximum extension and generally maximum at design position. It is best presented in terms of a curve with effective area plotted against stroke, Figure 13. At any position of the bellows the effective area is equal to the load at that position divided by the air pressure at that position. Here again this information can best be obtained by actual test measurement; however, if a bellows is not available, the effective area can be computed from design layouts using diaphragm theory.

Design Position. This is the position which the bellows will take under design load. Compression (jounce) and extension (rebound) are measured from the design position.

Design Load. This is the load the bellows is normally expected to carry under static conditions. A vehicle may have several design loads, such as curb load and full load. Separate calculations are required for each condition.

Design Pressure. This is design load divided by effective area at design position under static conditions.

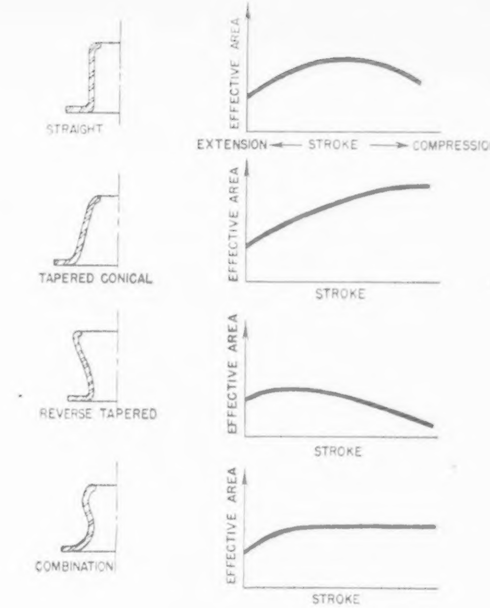


Fig. 12. Influence of pedestal shape on effective area change for 1X airspring

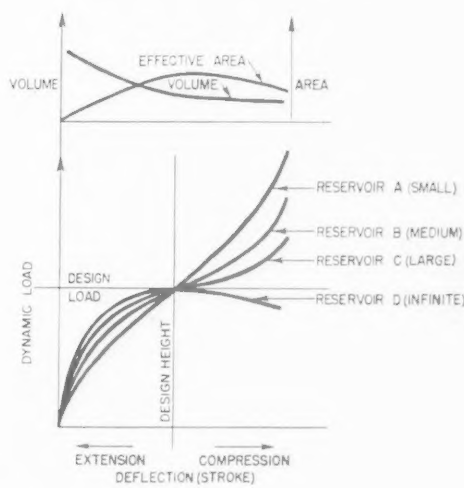


Fig. 13. Performance characteristics of 1X and 2X airspring bellows

NOMENCLATURE

- L — dynamic load, lb.
- P — absolute pressure, psi.
- V — bellows volume, cu. in.
- V_R — reservoir volume, cu. in.
- X — deflection from extended position, in.
- A — effective area, sq. in.
- X_D — design position
- γ — polytropic coefficient
- B, C, K — equation constants

RELATIONSHIP EQUATIONS

$$1.\quad L_{X_D} = (P_{X_D} - 14.7)A_{X_D}$$

$$2.\quad P_X = P_{X_D}\left(\frac{V_{X_D} + V_R}{V_X + V_R}\right)^r$$

$$3.\quad V_X = V_0 - BX$$

$$4.\quad A_X = CXe^{-KX}$$

$$5.\quad L_X = \left[P_{X_D}\left(\frac{V_0 - BX_D + V_R}{V_0 - BX + V_R}\right)^r - 14.7\right] CXe^{-KX}$$

A dynamic load-deflection computation is carried out in the following way:

(a) Calculate the design pressure for design position using Equation (1).

(b) Write equations to relate volume and deflection, and effective area and deflection. Equations (3) and (4) are typical of these relationships for single convolution-type bellows. The equation constants must be determined for each-size bellows.

(c) Calculate dynamic load-deflection values using Equation 5 and plot a load-deflection curve, Figure 13. Repeat for various reservoir sizes.

(d) Obtain the equivalent static deflection for any chosen curve and any part of the stroke by constructing a tangent to the curve at that point and measuring the intercept on the abscissa, Figure 8.

For an undamped spring-mass system with a single degree of freedom, the natural frequency

$$CPM = \frac{188}{\sqrt{\text{equiv. static deflection}}}$$

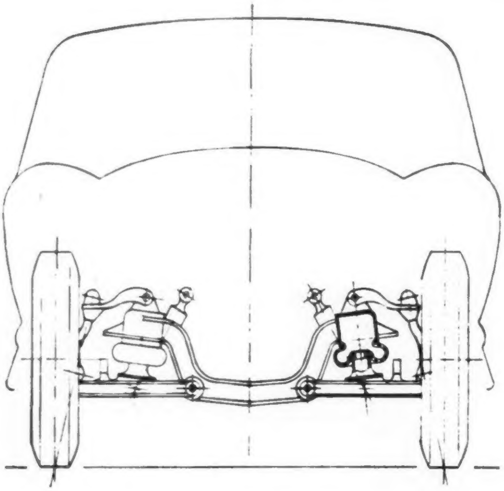


Fig. 14. Typical front-end suspension with lever ratio of 2:1 on airspring

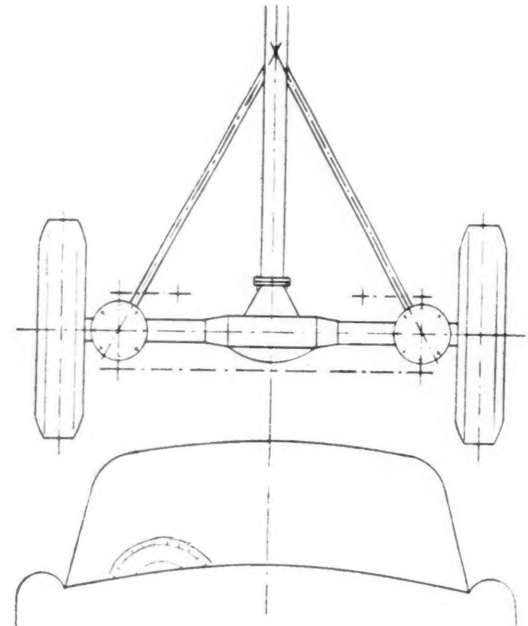


Fig. 15. Torque-tube-drive rear suspension with transverse control bar

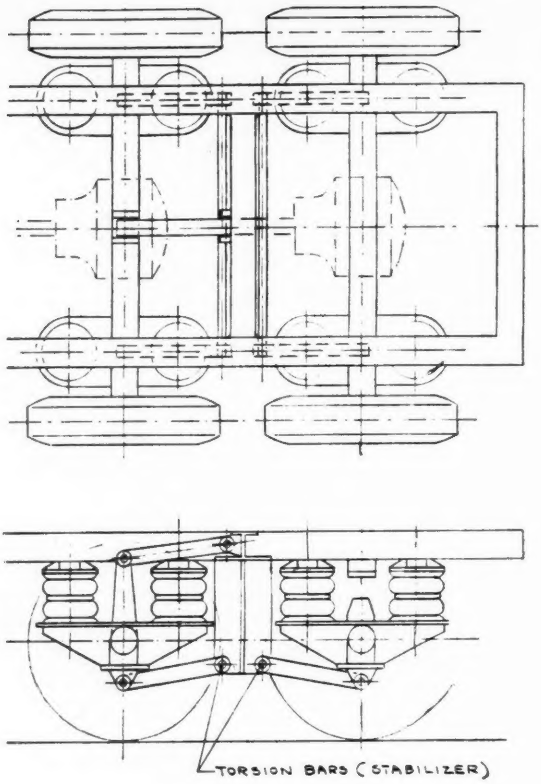


Fig. 16. Tandem axle truck rear suspension

(e) Step (d) gives the natural frequency of the airspring itself. If the suspension is not direct acting, the system will have a different natural frequency. The equivalent static deflection at the wheel equals the bellows equivalent static deflection multiplied by the suspension lever ratio. The natural frequency of the suspension

$$CPM = \frac{188}{\sqrt{\text{equiv. static wheel deflection}}}$$

Examination of Figure 8 shows that the airspring has a different equivalent static deflection and, therefore, a different natural frequency for each position of the stroke. This means that no resonant forced frequency can cause a large amplitude build-up. Thus, the airspring has a form of non-energy-consuming damping.

Generally, performance calculations are based upon a straight stroke. Many applications require the airspring to operate on an arcuate stroke in one or even two planes. While it is possible to make calculations for such conditions, the process becomes very time-consuming. Since it is desirable to obtain actual performance curves from test data in any case, the straight stroke calculations serve their purpose in initial evaluation of a design based upon desired load, stroke, air pressure, and reservoir size criteria.

Theory must be backed up with both performance and endurance tests. Shapes which appear to be most desirable from theoretical considerations may prove

(Continued on page 581)

The Future of Commercial Synthetic Rubbers[1]

Conway Studios

The Author

By R. G. SEAMAN

RUBBER WORLD, *New York, N. Y.*

IN DISCUSSING "The Future of Commercial Synthetic Rubbers" I think you will agree with me at the outset that the future of the entire rubber industry in this country and in the world, for that matter, depends on the future of commercial synthetic rubbers.

I might add that predicting the future of anything is difficult these days, and predicting the future of commercial synthetic rubbers is no exception. Then there is the matter of how far one can go with the considerable number of commercial synthetic rubbers on the market at the present time; and, finally, how do you define a rubber so as to identify it specifically from a soft plastic?

For the purposes of this talk I have limited myself to styrene-butadiene, neoprene, butyl, nitrile, and silicone rubbers. I will try to review the future world supply and demand situation for synthetic rubbers up to 1965 or 1970 in some cases; I will try to review the future supply and demand picture for the United States into the middle 1960's; and I will try to present a summary of some information recently obtained by RUBBER WORLD with regard to the present and future of SBR, neoprene (CR), butyl (IIR), nitrile (NBR), and silicone (Si) rubbers.

Historically, the rubber products industry began with the discovery of vulcanization by Charles Goodyear in 1839, but the rubber industry might be said to have reached maturity consumptionwise about 100 years later, when for the first time, in 1936, the world used more than one million long tons of rubber.

In 1936 this million tons of rubber were practically all natural, but in 1957, only 21 years later, the world used 3,132,500 tons of rubber, of which 1,262,500 tons, or 40.3%, were synthetic rubber. Of this 3,132,500 tons, the United States used 1,469,040 tons, 63%, or 929,279 tons, of which were synthetic rubber. The rest of the Free World used 1,663,460 tons in 1957; only about 23%, or 382,596 tons, of which were synthetic rubber.

Future World Supply and Demand

With regard to future world supply and demand, it is estimated that in 1967 the world will use about 4.5 million tons of new rubber, both natural and synthetic, a year. Although it has been considered generally that natural rubber availability would remain at about two million tons a year through 1965, there are some who feel that more than two million tons may be available at about that time or shortly thereafter. In a talk before the Akron Rubber Group on April 11,[2] W. J. Sears, vice president of The Rubber Manufacturers Association, Inc., suggested that by 1970 natural rubber production would amount to 2.5 million tons. He pointed out, however, that the Soviet bloc countries are expected to use around 400,000 tons of this natural rubber so that only 2.1 million tons would remain for use by the Free World.

The Commercial Chemical Development Association held a meeting in New York on March 27 on synthetic rubber and its impact on industry in this country and abroad. A rather complete report is presented in the May issue of RUBBER WORLD,[3] and I will refer several times in this talk to statements made and information given by the participants in that meeting.

For example, world new rubber availabiliy and demand were discussed by O. V. Tracy, president of Enjay Co., Inc., and I am indebted to Mr. Tracy for the use of some of the illustrations used in his talk. Figure 1 covers the world situation and outlook 1950 through 1965, divided into the period 1950-1955 before the sale of the SBR plants to private industry, and the period 1955 through 1965 after the sale of the government plants. Mr. Tracy used production rather than consumption figures, both past and prospective, to show the total available supply of natural rubber and considered the production figures for synthetic rubber at least roughly equal to consumption. No allowance was made in compiling the total synthetic rubber capacity figures for synthetic polyisoprene, of which there could be a sizable production in the 1960's.

Note that from 1957 on there is quite an excess of capacity of synthetic rubber for the world as a whole, but that this excess gradually diminishes until it disappears by 1965. It should also be observed that in Figure 1 the total natural and synthetic rubber production, which is the world's estimated consumption, rises in future years even more steeply than during the past seven years.

There are those, including Mr. Tracy, however, who

[1] Presented before the Elastomer & Plastics Group, Northeastern Section, ACS, Boston, Mass., May 20, 1958.
[2] RUBBER WORLD, June, 1958, p. 432.
[3] P. 266.

The Future of Commercial Synthetic Rubbers

The future of the world's rubber industry depends on the future of its synthetic rubber producing industry. Consumption of new rubber in the Free World in 10 years is estimated at 4.5 million long tons a year. It is unlikely that more than 2.5 million tons of natural rubber will be available in 1968.

World synthetic rubber production capacity of at least 2.25 million tons will be available in 1965, and more capacity will be built if the demand in the late 1960's justifies it. New rubber will be available in ample supply, competition between producers keen, and prices reasonably stable during the next decade.

In the United States, synthetic rubber capacity will remain ahead of domestic consumption plus export through 1965. Styrene-butadiene rubber consumption in this country is expected to expand at the rate of about 4% a year; emphasis is now on improving existing types, and better color and improved oil, carbon black, and oil-black masterbatches will become available soon.

U.S.A. consumers of SBR are generally satisfied with the production, distribution, and service provided by producers of this type of rubber, but many consumers would still shift to natural rubber if the latter were cheaper.

Neoprene consumption plus export, now amounting to 100,000 tons a year, is expected to increase to 150,000 tons by 1965. Butyl rubber consumption plus export, now at 65,000 tons a year, is estimated at 130,000 tons in 1965. Nitrile rubber consumption plus export, now equal to 32,000 tons a year, should reach 40,000 to 45,000 tons in 1962, and 60,000 tons by the year 1965.

Silicone rubbers and compounds, which are used to the extent of about four million pounds a year at the present time, should increase in consumption to seven to nine million pounds in 1960, and 20 million pounds in 1965.

feel that world synthetic consumption will not rise quite so rapidly as Figure 1 indicates. In Figure 2, therefore, total consumption is estimated at about four million tons in 1965, of which two million tons are expected to be synthetic, and two million tons natural rubber. Mr. Tracy said he felt that an industry of the size to which rubber has grown can afford some excess capacity. All plants of an industry are never under full operation at the same time, and when they are distributed in as many countries as synthetic rubber plants will be, a modest world excess is not of great consequence. What needs to be emphasized, he added, however, is that further expansions beyond those currently announced should be undertaken only with notable market justification.

Figure 3 and Table 1 were prepared from some figures presented by Mr. Sears before the RMA at its annual meeting in November, 1957,[4] and show total U.S.A. and Free World synthetic rubber capacity through 1965, U. S. A. capacity, and synthetic rubber consumption worldwide, as estimated at that time. Note that total world synthetic rubber capacity and consumption are pictured as being in balance in 1965 at about 2.25 million tons.

I understand that the May, 1958, reevaluation of these figures now indicates that U.S.A. capacity may exceed the 1.75 million tons previously estimated for the early 1960's, and U.S.A. consumption is expected

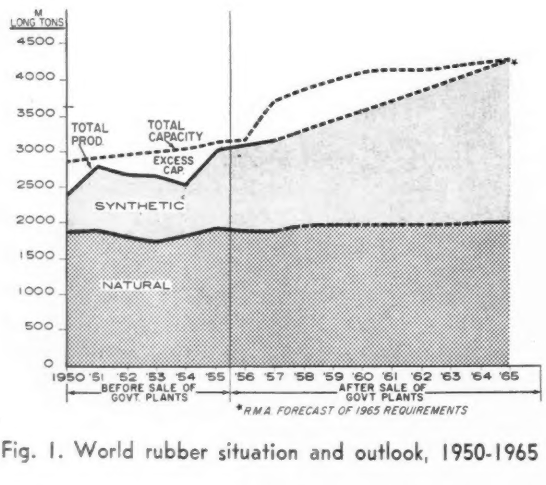


Fig. 1. World rubber situation and outlook, 1950-1965

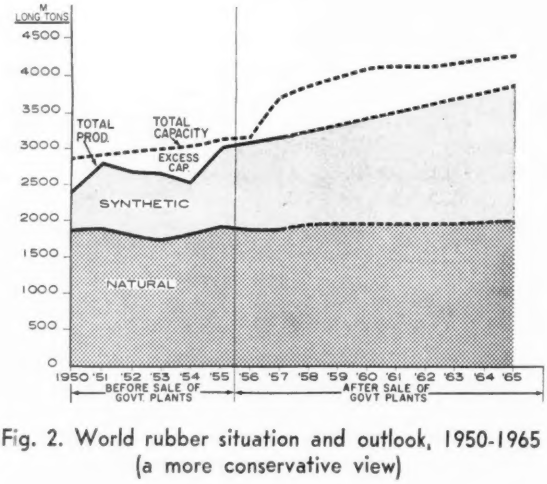


Fig. 2. World rubber situation and outlook, 1950-1965 (a more conservative view)

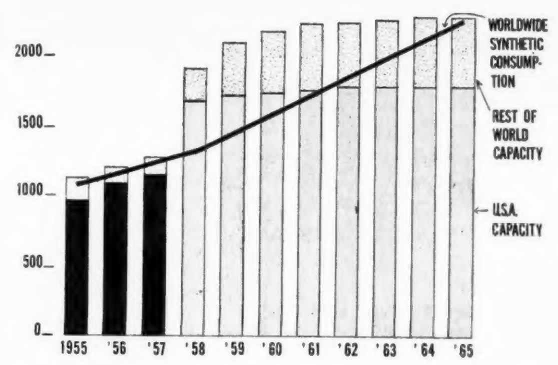


Fig. 3. World synthetic rubber capacity (U.S.A. plus Free World) *vs.* world synthetic rubber consumption, 1955-65 (1,000 long tons)

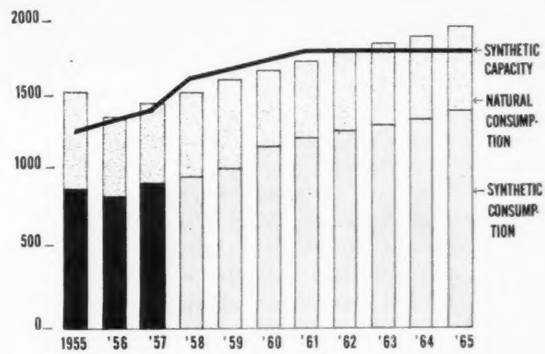


Fig. 4. U.S.A. new rubber consumption *vs.* synthetic capacity, 1955-65 (1,000 long tons)

to be at a somewhat lower level during that period. If so, the synthetic rubber production capacity in the U.S.A. in the middle 1960's may exceed domestic consumption by an even greater amount.

Some estimates of European rubber production and consumption made at the March 27 CCDA[3] meeting by A. J. Pickett, editor, *Rubber & Plastics Age* of London, are also pertinent at this time. Mr. Pickett stated that although only 152,500 tons of synthetic rubber were consumed in Western Europe in 1956, this consumption may rise to more than 400,000 tons in 1960 and 600,000 tons in 1965. Synthetic rubber capacity in Western Europe was estimated at 208,000 tons in 1958 and 359,000 tons in 1960. Synthetic rubber consumption in Western Europe could increase from 20% of total new rubber in 1956 to about 40% in 1960 on this basis, and Mr. Pickett suggests that if an additional 250,000 tons from North America were used, 70% of the total new rubber used in Western Europe might be synthetic, and a significant surplus of natural rubber might develop in the world at that time.

Mr. Pickett also estimated that synthetic rubber consumption in the Soviet countries amounted to about 62% of the total new rubber used in 1956 and could reach 70% by 1965. Although synthetic rubber production capacity in Eastern Europe is not accurately known, an output of 462,000 tons in 1958 and 650,000 tons in 1960 is expected, and by 1960 as much as 250,000 tons of synthetic rubber may be available for export from Eastern Europe.

H. C. Bugbee, president of the Natural Rubber Bureau, made some estimates of natural rubber use by East European countries at the previously mentioned CCDA meeting. In 1960 he predicted these countries would require 271,000 tons of natural rubber. Mr. Sears in his April 11 Akron Rubber Group talk subtracted this 271,000 tons of natural rubber from the earlier RMA estimate of 1,915,000 tons of natural rubber available in 1960 to indicate that this subtraction left 1,644,000 tons of natural rubber available to the Free World. Total natural and synthetic rubber consumption by the

[4] *Ibid.*, Dec., 1957, p. 426.

TABLE 1. WORLD SYNTHETIC RUBBER CAPACITY (U.S.A. PLUS FREE WORLD) *VS.* WORLD SYNTHETIC RUBBER CONSUMPTION

(1,000 Long Tons)

	SR Capacity		
Year	Total	U.S.A.	SR Consumption Worldwide
1955	1085	970	1062
1956	1211	1080	1132
1957	1255	1110	1262
1958	1874	1666	1345
1959	2028	1695	1470
1960	2137	1713	1620
1961	2191	1732	1735
1962	2225	1751	1853
1963	2241	1751	1985
1964	2251	1751	2110
1965	2251	1751	2235

SOURCE: The Rubber Manufacturers Association, Inc., Nov., 1957, annual meeting.

TABLE 2. U.S.A. NEW RUBBER CONSUMPTION *VS.* SYNTHETIC CAPACITY

(1,000 Long Tons)

	Consumption			Capacity
Year	Total	NR	SR	SR
1955	1530	635	895	970
1956	1436	562	874	1080
1957	1475	544	931	1110
1958	1525	(534)	(991)	1666
1959	1575	(551)	(1024)	1695
1960	1635	(572)	(1063)	1713
1961	1690	(507)	(1183)	1732
1962	1755	(526)	(1229)	1751
1963	1820	(546)	(1274)	1751
1964	1885	(565)	(1320)	1751
1965	1960	(588)	(1372)	1751

SOURCE: RMA, Nov., 1957, annual meeting for total consumption and capacity and actual NR and SR consumption through 1957. NR and SR consumption estimates, in parentheses, RUBBER WORLD estimates based on synthetic as 65% of total 1958-1960, and on 70% of total 1961-1965.

Free World in 1960 of 3,781,000 tons less 1,644,000 tons of natural available gives 2,137,000 tons of synthetic rubber required. If we add up the 1960 synthetic rubber capacity of the U.S.A. of 1,713,000 tons; Canada, 135,000 tons; Western Europe, 359,000 tons; and the possible 250,000 tons available from Eastern Europe, we have 2,457,000 tons available.

If the Free World used all of this 2,457,000 tons of synthetic rubber, 300,000 tons of natural rubber would exist as surplus; if the Free World used only 2,137,000 tons of synthetic rubber, 300,000 tons of synthetic rubber could exist as surplus. In the former case the synthetic used would be 65% of total, in the latter 56%. Actually, the synthetic/natural use ratio will depend to a considerable degree on the relative prices of natural and general-purpose synthetic rubber at that time. Of even greater importance is the fact that these figures or any similar ones emphasize that rubber should be in ample supply, competition keen, and prices stable and reasonable for the next several years, barring any world conflict.

U.S.A. Supply-Demand

Total new rubber consumption in the United States for the period from 1955 through 1965, actual natural rubber consumption and synthetic rubber consumption for the period 1955 through 1957, and estimates of U.S.A. synthetic capacity 1958 through 1962, were given by the RMA in November, 1957. Using a 65% of total figure for the period 1958 through 1960 and a 70% of total figure for 1961 through 1965, I have estimated U.S.A. synthetic rubber consumption for these periods. I have included the U.S.A. synthetic rubber capacity for 1955 through 1957, and all of these figures are shown in Figure 4 and Table 2.

Obviously the 1958 consumption figures are too high in light of performance to date in 1958, and there will be those who will take exception to the 70% of total for synthetic rubber beginning in 1961. There are others, of whom I am one, who feel that developments in the field of synthetic rubber will make this 70% of total figure in 1961 or thereabouts an actuality.

You will note that U.S.A. synthetic capacity is well in excess of domestic synthetic consumption 1958 through 1965. Exports of synthetic rubber amounted to 203,000 tons in 1957, which brought the total demand for U.S.A. synthetic in that year to 1,130,000 tons, or about equal to production. In view of the synthetic rubber capacity being built outside the U.S.A., exports between now and 1965 should remain between 200,000 and 250,000 tons.

In Table 3 are listed domestic synthetic rubber consumption plus export figures for the period 1955 through 1962 for SBR, CR (neoprene), IIR (butyl), and NBR (nitrile) rubbers and for CR, IIR, and NBR through 1965. The total for these four rubbers is compared with the RMA synthetic capacity figures and shows almost 350,000 tons' excess capacity even on this basis in 1962. If we extrapolate the SBR figure through 1965 and add the figures for the other three rubbers we can suggest a figure of 1,600,000 tons, which reduces the spread between capacity and use to 150,000 tons in that year.

Now let us see what the producers of SBR, neoprene, butyl, nitrile, and silicone rubbers think about the present future prospects for these synthetic rubbers. I think some of the comments made at the March CCDA meeting by the SBR producers are particularly interesting. We have also assembled some information on what consumers of SBR think of present and future trends for this major general-purpose synthetic rubber.

CCDA Comments on SBR

W. P. Gee, president, Texas-U. S. Chemical Co., stated at the meeting of the Commercial Chemical Development Association in New York that the SBR industry after a period of profitable operation from 1955 on, now finds itself in a period of lower consumption and resultant cutbacks in production, with competition intensified. An economic reappraisal of the industry, operating at rates below full plant capacity, with higher commercial expenses and increasing unit production costs, is therefore necessary. In exchange for a fair selling price for synthetic rubbers, the industry can through research offer

TABLE 3. U.S.A. CONSUMPTION PLUS EXPORT FOR FOUR MAJOR COMMERCIAL SYNTHETIC RUBBERS *VS.* CAPACITY
(1,000 Long Tons)

		Consumption Plus Export				
Year	RMA Cap.	Total	SBR	Neoprene (CR)	Butyl (IIR)	Nitrile (NBR)
1955	970	989	803	91	64	31
1956	1080	1022	836	96	58	32
1957	1110	1130	925	106	65	34
1958	1666	(1100)	(889)	(108)	(74)	(29)
1959	1695	(1221)	(994)	(111)	(83)	(33)
1960	1713	(1286)	(1044)	(113)	(91)	(38)
1961	1732	(1356)	(1098)	(116)	(100)	(42)
1962	1751	(1408)	(1135)	(118)	(108)	(47)
1963	1751	—	—	(120)	(117)	(51)
1964	1751	—	—	(123)	(126)	(56)
1965	1751	—	—	(125)	(134)	(60)

SOURCE: Synthetic rubber capacity from RMA, Nov., 1957, annual meeting. Total and consumption by types, 1955-57, from United States Department of Commerce figures; 1958-62 and 1965 from producer estimates of domestic consumption and export and supplied RUBBER WORLD.

new diverse markets and stable prices, Mr. Gee further declared.

Continuing expansion of the industry at a rate of about 4% a year through the early 1960's was predicted. To compete in the tight market for capital investment and development funds, however, the synthetic rubber industry must match or better the economics realized by the growth products of the chemical, petroleum, and plastics industries to which it is related.

P. W. Cornell, vice president, Goodrich-Gulf Chemicals, Inc., at the same CCDA meeting pointed out that whereas synthetic rubber research under government operation involved an expenditure of about $6 million a year, producers are now spending at a rate of at least $12 million a year, or 2½% of sales.

Technical service to customers is more active now than under government operation, and although producers are more concerned with improving existing rubbers than developing new types, this latter phase of development is not being neglected. Emphasis is now on better product color and improved carbon black, oil, and oil-black masterbatches, and it was predicted that superior masterbatches of all these types would become available soon.

There is a continuing need of research because of the competition of urethane rubbers, natural rubber, and to provide an SBR with better hysteresis properties in order that it be more competitive wih natural rubber.

A. B. Leonard, director, rubber chemicals division, Phillips Chemical Co., emphasized that technical service to synthetic rubber customers is essential to any marketing program today. He doubted, however, if any substantial increase in expenditures for technical service in this country today would result in an increase in market, but the export market is a different matter. He added that although American production costs may be lower than those of foreign synthetic rubber producers for some time, import duties may give synthetic rubber produced abroad a delivered price advantage which has to be offset by better quality and technical service of American producers.

J. P. Cunningham, manager, synthetic rubber sales division, Shell Chemical Corp., discussed the differences between government and private industry operation of the synthetic rubber industry from the marketing viewpoint. He emphasized that under government operation, synthetic rubber distribution to consumers was handled by a central agency, an efficient arrangement, but one which required ordering in advance. Today competition has assured every consumer prompt shipment of the rubber he desires, in the package he prefers, made by the manufacturer he favors, from a convenient stock point, thus reducing his advance commitments and the size of his raw material inventories.

C. A. Cain, vice president, Petro-Tex Chemical Corp., stated that by the end of 1958, butadiene capacity in this country will be more than 1,200,000 short tons; while consumption will be about 800,000 tons. The price has changed from an f.o.b. plant basis to a delivered basis, with a consequent increase in producers' transportation costs.

In 1958, butadiene plants will be built in Canada, Italy, Germany, and England, and there are rumors of plants under consideration in several other countries. Some of the new SBR plants have been completed abroad ahead of associated butadiene plants, and there has been some export of butadiene, but it is unlikely that this export will be on a continuing basis.

The independent butadiene producers are concerned about having only one customer, the rubber industry, but butadiene's chemical versatility, low stable price, and abundant supply will in time lead to substantial new uses for butadiene, in Mr. Cain's opinion.

RUBBER WORLD SBR Survey

A questionnaire was circulated among the SBR producers in this country and Canada in April in an attempt to obtain some further first-hand information on what these producers thought about present and future trends for this major synthetic rubber. The replies have been summarized in Table 4.

TABLE 4. SUMMARY OF REPLIES TO SBR PRODUCERS QUESTIONNAIRE

1. Number of types and packages marketed by all producers
   In May, 1956—252. In May, 1958—433.
2. % of SBR supplied to small business

	In May, 1956	In May, 1958
Company A	17	20
B	17	17
C	20	13
D	37	73
E	19.5	16
F	57	50

3. Capacity increases contemplated during the next 12 months—none.
4. Trends in demand for various SBR types
   Hot SBR—5 said decrease
   Cold SBR—6 said increase
   Oil-extended SBR—5 said increase
   SBR black masterbatch—4 said increase; 2 said decrease
   SBR oil-black masterbatch—2 said increase; 2 said decrease
5. SBR price increase should amount to 1¢ a pound, according to 2 producers; 1.5¢, according to 3; 2¢, according to one.
6. Average estimates for SBR export tonnage: 1958—158,000 L.T.; 1959—154,000; 1962—177,000.
7. Consumption of SBR latices to increase or decrease? Five producers said increase; 1 said decrease; 1 said decrease, then increase.

The increase in the number of types of SBR and the number of ways in which it is being packaged are summarized from the replies to the first question and shows that this number has increased from 252 in May, 1956, to 433 in May, 1958. This is a crude measure of this change and does include duplication of types and packages, but is useful as a rough estimate of increased marketing activity on the part of the SBR producers in the past two years.

The answers to the second question are also not very quantitative, but they do indicate what has been taking place with six producers and their small business market.

One producer has apparently developed the small business market extensively; while the others reported here have not increased their small business market or have registered a decline.

The answers to question 3 confirmed the statistics presented earlier, that is, no more SBR capacity is needed or is planned at least within the next 12 months.

Trends in demand for the various types of SBR as reported by the producers show that five expect the demand for hot SBR to decrease; six expect the demand for cold SBR to increase; and five expect the demand for oil-extended SBR to continue to increase. Opinion on the future of carbon black masterbatches was divided, with four producers looking for an increase in demand, and two expecting a decrease. Two producers expect an increase in demand for oil-black masterbatches, and two expect this demand to decrease.

Table 4 shows also that SBR producers generally feel that there should be an increase in the price of this rubber in order to compensate for rising production costs. Two producers felt that this increase should amount to 1¢ a pound; three want 1.5¢ a pound; and one wants 2¢ a pound.

Export tonnage of SBR was estimated at 158,000 tons this year, 154,000 tons in 1959, and 177,000 tons in 1962.

Five producers expect the consumption of SBR latices to increase, and two expect it to decrease, in spite of the competition afforded by foam rubber made from urethanes instead of natural and/or synthetic rubbers.

A questionnaire was also circulated among 250 consumers of SBR, the majority of whom were manufacturers of rubber products other than tires. Replies received totaled only about 60, but the results are summarized in Table 5.

TABLE 5. SUMMARY OF REPLIES TO SBR CONSUMERS QUESTIONNAIRE

1. Production (quality and quantity), distribution, and service for SBR, as compared with May, 1956: 42 said better; 18 said equal. Comments: Distribution and service are better, according to 3 consumers; quality and color better, according to one.
2. Types of SBR difficult to obtain since May, 1956: none said 37 consumers; two said 1010; one each said 1004, 1018, 1019, 1100, 1505, and 1601.
3. New types of SBR desired: none said 21 consumers; one each, however, said they would like the following new types and improved properties:
   - LTP, non-pigmented, 1500 type, non-staining with better aging and gum strength
   - LTP, carbon black masterbatch, 1600 type with better dispersion of ISAF type black
   - LTP, oil-extended, 1700 type, capable of high non-black loading without excessive tack
   - LTP, oil-black masterbatch, 1800 type, with higher black (HAF or ISAF) and oil
4. Extent of replacement of SBR with elastomeric plastics during the past two years: none said 37 consumers; four said they used some polyvinyl chloride; three said they used some polyethylene.
5. Will LTP replace hot SBR? If not, why not? Yes answered 27 of 54 consumers to the first question; 17 said no. Ten consumers like the processing of hot SBR; three liked its better aging; one liked its better tack; and one liked its better low-temperature properties.
6. Use of oil-extended SBR to increase? Twenty-eight consumers said yes; 19 said no. Favor 50% oil content? Ten consumers said yes; 26 said no. Consider oil as rubber hydrocarbon? Thirteen consumers said yes; six consider two-thirds of the oil as RHC. Consider oil as processing oil? Eighteen consumers said yes; five said one-half is considered as processing oil.
7. Will current improvements in black masterbatch increase demand? Thirty-four consumers said yes; 6 said no. Reasons for affirmative answer: cleanliness said 9; better dispersion of black said 6; faster mixing said 7; better physical properties said 4.
8. Will use of oil-black masterbatch increase? Ten consumers said yes; 8 said no. Improvements needed are such types with a greater variety of blacks, less blooming of oil to surface, and lower cost of the masterbatch.
9. Is present packaging of SBR satisfactory? Forty-three consumers said yes; 8 said no. Seventeen consumers favor SBR in the form of crumbs or pellets.
10. Amount of increase in cents per pound that would decrease SBR consumption if natural rubber then cheaper? Twenty-five consumers said any increase in the price of SBR would cause them to switch to natural rubber; two would wait until the differential was 5¢; nine would wait until 3¢; four until 2¢; and three until 1¢.

This table indicates first that 42 SBR consumers feel that the production, distribution, and service provided by SBR producers now, as compared with May, 1956, is better; while 18 consumers feel that it is about the same. Three consumers stated that distribution and service were better, but quality was about the same; and one consumer said the quality and the color of SBR were better.

Despite the generally good availability of all types of SBR during the past two years, two consumers found type 1010 difficult to obtain, and a few reported types 1004, 1018, 1019, 1100, 1505, and 1601 were not immediately available when desired.

Table 5 reports that of those replying, 21 had no need of new types of SBR; while a few others would like to have the types indicated with the special features listed.

The answers to the fourth question show, first, that contrary to a widely held belief, as far as the consumers involved here are concerned, SBR has not been replaced by elastomeric plastics to any large extent during the past two years.

Cold SBR will eventually replace hot SBR according to 27 of 54 consumers; while 17 think there will always be a demand for hot SBR. Ten liked the better processing of hot SBR; three liked its better aging properties; and one each liked the better tack and low-temperature properties of hot SBR.

The use of oil-extended SBR will increase according to 28 consumers; while 19 think it will not. Ten consumers favor a 50% oil-extended SBR, but 26 do not. Thirteen consumers consider the oil as rubber hydrocarbon, but six consider only two-thirds of it as rubber hydrocarbon. Eighteen consumers consider all of the oil as processing oil, and five consider half of it as processing oil.

The answers to the seventh question report that recent developments with the black masterbatch should increase demand according to 34 consumers; while 6 do not

think demand will increase because of these developments. In addition to cleanliness resulting from the use of these masterbatches in the plant, improved dispersion, faster mixing, and better physical properties were cited as reasons for possible increased use of these masterbatches.

Opinion was almost equally divided on the possibility of greater use of oil-black masterbatches. Consumers feel that these masterbatches should be available with a greater variety of blacks; oil blooming should be reduced; and the price should be lower.

The present packaging of SBR is satisfactory to 43 consumers out of 51. SBR in the form of crumbs or pellets is favored by 17.

Apparently if SBR and natural rubber are about the same price per pound, 25 consumers out of 43 would start to use more natural rubber if any increase in the price of SBR were made. Two of these 43 consumers would not change until the price difference amounted to 5¢ a pound; nine would change at 3¢ a pound; four at 2¢ a pound, and three at 1¢ a pound.

Neoprene (CR)

The Du Pont company has domestic neoprene capacity of 125,000 long tons and is building a plant in Northern Ireland with a design capacity of about 22,000 tons. By 1960, total Du Pont neoprene manufacturing capacity will be approximately 147,000 tons annually, and this capacity can be readily expanded to meet any increased demand.

It is estimated that by 1965 there will be sales demand for all of this production both domestic and abroad. Since it is anticipated that the export market will grow faster than the domestic market, Du Pont expects to export neoprene even when the new plant in Ireland is in production.

Neoprene consumption is about 90% dry types and 10% latex types. Of the 11 dry neoprene types, the most important is Type W, which accounts for about 30% of the total. Type W is a general-purpose neoprene and does not contain any sulfur or sulfur-bearing compounds, has good processing, storage stability, better heat resistance, and lower compression set than the other general-purpose neoprenes.

Neoprene Latex Type 842-A, an improved general-purpose latex, accounts for 43% of the neoprene latex sales. It is used in dipped goods, paper saturation, and in the industrial fabric coating fields.

New developments in neoprene include an improved adhesive grade (Type AD) similar to Type AC in crystallization rate, but having improved color stability and stability to change in Mooney and solution viscosities. Also, a new adhesive grade of neoprene latex Type 673 superior to anything currently available for contact adhesives is about to be announced. It is expected to find a wide market for general adhesive use and to replace solvent cements in many places.

In addition, a new fluid neoprene Type FB has been developed to fill the demand for high solids content coatings, non-volatile calks, and putties and as a vulcanizable plasticizer for other elastomer compounds.

Improved processing neoprenes are also expected in the not-too-far distant future. Neoprene competes with all commercial elastomers and with many important plastics, specifically polyvinyl chloride and polyethylene. Neoprene also competes with SBR and natural rubber in certain parts of tires, and with nitrile rubbers where oil resistance is important. Where weathering is important in absence of oil resistance, butyl rubber is competitive; chlorosulfonated polyethylene, Hypalon,[5] competes with neoprene in those areas where color retention is important and where superior resistance to heat, ozone, and weathering is a factor.

Butyl Rubber

Butyl rubber consumption in the United States has been variable in recent years. In 1953, the last full year before the acceptance of the tubeless tire, consumption amounted to 77,826 tons, practically all of which was used in inner tubes. In 1957, about 57% of the 1953 consumption, or about 44,000 tons, were used in inner tube production. A steady decline in the consumption of butyl rubber in inner tubes to about 50% of the 1957 level, or about 22,000 tons, is anticipated by 1965.

Consumption of butyl rubber in the U.S.A. is expected to increase by approximately 10% per year through 1965, however, to a total of about 125,000 tons at that time. Butyl rubber exports, which amounted to only 2,831 tons in 1954, have been in the 8,000-to-9,000-ton area since that time and are expected to stay at this level or increase somewhat by 1965.

Butyl rubber production capacity in the U.S.A. amounts to 105,000 tons, and the above indicated expansion of consumption should mean that it should exceed domestic capacity within the next five years. Plans have been announced by Petroleum Chemicals, Inc., to build a butyl plant, and, of course, presently existing facilities can be expanded as required. A butyl rubber plant of 20,000 tons' capacity will begin production in France before the end of 1958. This capacity will satisfy the entire French market and that of neighboring countries for at least a couple of years, but Enjay Co. suggests that many European tire companies, who have no vested interest in SBR facilities, are taking a very practical look at butyl rubber for use in composite tires, that is, tires with a butyl rubber tread and a natural rubber carcass. In this event demand for butyl rubber in Western Europe will again exceed local capacity.

Predominant factors in this predicted growth of the use of butyl rubber are the increasing acceptance of butyl tires and further expansion into proven non-transport applications such as automotive and industrial mechanical goods, cements and adhesives, coated fabrics, wire and cable, etc. It is expected that demand for non-staining grades will increase as butyl rubber moves into additional automotive parts and light-colored products. The general trend will probably be toward the low and high unsaturation grades, and the use of the intermediate unsaturation grades will decline.

Halogenated butyl rubber, MD 551, and latex, MD 600-55, have been announced and are in pilot-plant pro-

[5]E. I. du Pont de Nemours & Co., Inc., trade mark.

duction. The new chlorine-containing butyl is said to be superior to regular butyl rubber in rate of cure, heat resistance, and dynamic properties. MD 551 has demonstrated its value in tire curing bladders where at 385° F., 625 tires were cured before failure, as compared with 200 with conventional bladders. This new butyl is a "low unsaturation" polymer and has the inherent properties of the regular butyl, including superior air-holding and ozone resistance. It is compatible with both natural rubber and SBR and may be cured with zinc oxide, and/or sulfur-containing accelerators, or with diamines, quinone dioximes, and polymethylolphenols.

Potential applications for MD 551 include use in truck tires, white sidewalls, retreads for tires, innerliners for tubeless tires, high-performance mechanical goods, and various products subjected to high temperatures such as curing press bladder, steam hose, conveyor belts, and wire insulation materials.

Butyl latex has contributed greatly to the success of the butyl tire and other applications where cord adhesion is necessary.

Butyl rubber is considered to be competitive particularly with natural rubber and SBR for tires, mechanical goods, sponge, etc. It is also considered to be competitive with neoprene where this polymer is currently used for reasons other than oil or flame resistance.

Nitrile Rubber

In Mr. Tracy's CCDA talk he indicated that installed capacity for the production of nitrile rubber in this country was 66,000 long tons at the end of 1957. This figure is close to the 67,400 long tons for the end of 1957 estimated in the President's Report to Congress of April 30, 1956.

Consumption in the United States has been about 26,000 tons in recent years and exports about 6,000 tons; U.S.A. producers' estimates of future production (equal to consumption plus exports) vary somewhat, and there is a tendency not to attempt projections beyond 1962. For that year production estimates ranged between 38,000 and 46,000 tons, of which 7,000 to 8,000 tons would be export.

Future demand according to types seems to indicate that this will be mostly for the medium acrylonitrile types although one producer points out that owing to the new highly aromatic automotive fuels being evaluated at the present time, the more solvent-resistant types may be required in increasing amounts.

Future new types are expected to feature higher nitrile contents, higher ozone resistance, and liquid polymers useful as binding agents and as non-extractable plasticizers for vinyl, phenolic, and melamine resins.

Neoprene, Thiokol[6] polysulfide rubbers, and acrylate rubbers are competitive with nitrile rubbers, but none of these materials is considered to be an exact replacement for nitrile rubbers, although all three have certain advantages and disadvantages with which nitrile rubbers cannot compete. If the silicone and fluorocarbon rubbers could be sold in the $1 to $2 price range, their volume might increase and effect the expansion of the nitrile rubber market somewhat. This possibility, however, does not seem likely in the near term future.

Silicone Rubber

It is estimated that the three producers of silicone rubber in this country made approximately four million pounds of silicone rubber compounds in 1957. Of this total about 2.8 million pounds were sold to rubber companies for further processing into fabricated parts; about 800,000 pounds were sold to wire and cable manufacturers; and the remaining 400,000 pounds were exported or used for miscellaneous applications. Geographically, about 80% of the silicone rubber sales in this country are made east of the Mississippi River.

Historically, the growth of silicone rubber sales has been both steady and rapid. Sales in 1945 were negligible. They expanded to 1,000,000 pounds in 1950 and are currently about four to five million pounds a year. By 1960, it is estimated that silicone rubber production will reach seven to nine million pounds and more than double this by 1965, when 16 to 20 million pounds will be sold.

A $50-million market was available to wire and cable and rubber products companies that manufactured items containing silicone rubber in 1957. This market is divided among the major end-use industries as follows: aircraft, $20 million; electrical, $7 million; appliance, $7 million; automotive, $6 million; and all other, $10 million. It has been emphasized that the relation of market size and pounds produced does not yield a valuable statistic since a great deal of the cost of silicone rubber parts is attributed to engineering.

There are currently six major types of silicone rubber compounds available, as follows: (1) general-purpose, which are regular dimethyl siloxanes; (2) low-temperature, phenyl-vinyl dimethyl siloxanes; (3) fluorocarbon silicone rubbers, or fluorine-containing dimethyl siloxanes; (4) room-temperature curing, dimethyl siloxanes; (5) high-strength rubbers, phenyl-vinyl dimethyl siloxanes; and (6) gum and base materials, dimethyl siloxanes.

Types 1 and 2 are used interchangeably for many applications; the type 2 materials are flexible down to —178° F.; while type 1 materials have a brittle point of —100° F.

New developments in the field of silicone rubbers include low shrinkage and low compression set stocks for adhesive applications. High-strength silicone rubbers and the fluorine-containing types are also relatively new, and it is these types where the greatest growth is expected in the near future.

Summary and Conclusions

To summarize, the future of the world's rubber industry depends on the future of the world's synthetic rubber producing industry because 10 years from now consumption of new rubber in the Free World is expected to be at the rate of 4.5 million long tons a year, and the most optimistic estimates of natural rubber availability at that time are for only 2.5 million tons. Of this 2.5 million tons of natural rubber Eastern Europe is likely to require about 400,000 tons in the 1965-70 period, leaving 2.1 million tons for the Free World.

[6] Thiokol Chemical Corp. trade mark.

Worldwide synthetic rubber production capacity for the four major commercial types of at least 2.25 million tons is predicted for 1965, and if the supply-demand balance at that time is as close as estimated, a larger production capacity will be provided. It would appear to be fair to say that to take care of the 4% growth of rubber use in the United States and the 9% growth predicted per year abroad, new rubber will be available in ample supply, competition keen, and prices reasonably stable during the next decade.

In the United States, synthetic rubber capacity for the four major commercial types may remain in advance of domestic consumption plus export through 1965; the difference will amount to 400,000 tons in 1960, but drop to 150,000 or 250,000 tons in 1965, depending on whether further additions are made to presently existing or planned capacity, and with special reference to the extent of the growth of the use of newer types such as polyisoprenes, polybutadienes, polyurethanes, etc.

The SBR industry in this country is expected to continue to expand at the rate of about 4% a year, if it can match or better the economics realized by growth products of the chemical, petroleum, and plastics industries to which it is related. SBR producers are spending at least $12 million a year on research and development, but to continue this rate of expenditure in face of a tight market for investment and development funds, operation at nearer production capacity levels or an increase in selling price or both may be required.

Emphasis is now on improving existing SBR types to provide better product color and improved carbon black, oil, and oil-black masterbatches, and it has been predicted that superior masterbatches of all these types will become available soon. Research is also being directed toward improving the position of SBR with respect to natural and urethane rubbers.

Consumers of SBR are generally satisfied with the production, distribution, and service provided by the producers of this type rubber; only a few special cross-linked, low water adsorption, non-staining grades have been occasionally hard to obtain in sufficient amounts and as promptly as sometimes desired. Many consumers do not consider the oil in oil-extended SBR as rubber hydrocarbon or only consider about one-half as RHC and one-half as processing oil. Improved carbon black and oil-black masterbatches will find a larger market. Apparently at least one-half of the consumers of SBR would switch to natural rubber if the price of SBR were increased, and natural rubber were available at even 1¢ a pound lower price.

Neoprene consumption in this country plus export, now amounting to about 100,000 tons a year is expected to increase to 150,000 tons by 1965. Neoprene consumption is about 90% dry types and 10% latices. New developments in neoprene include a new adhesive-grade dry rubber and a new adhesive grade latex, and a new fluid neoprene. Improved processing neoprenes are also expected to be announced in the near future.

Butyl rubber consumption plus export is expected to grow from the present 65,000 tons a year to more than twice that amount by 1965. Production capacity in this country should be about equal to demand in the next five years, but even with a 20,000-ton plant starting up in France this year, export demand is expected to hold up well in the 1960's. Halogenated butyls and new latices are recent developments and should broaden the market for rubbers of this type.

Nitrile rubber consumption plus exports of about 26,000 and 6,000 tons, respectively, in recent years should amount to 40,000 to 45,000 tons in 1962 and may reach 60,000 tons by 1965, in spite of production capacity built and building abroad. Future new types are expected to feature higher nitrile contents, higher ozone resistance, and liquid polymers useful as binding agents and as non-extractable plasticizers for soft plastics. The greatest volume increase marketwise, however, may be with the medium acrylonitrile grades.

Silicone rubbers and compounds which are used to the extent of about four million pounds a year at present should increase in consumption to seven to nine million pounds in 1960 and 16 to 20 million pounds in 1965. New low shrinkage, low compression set, and high-strength stocks and fluorine-containing types are expected to provide the greatest growth of consumption in the near future.

The future for synthetic rubbers looks—good!

New Tin Rubbers Revealed

Polymerization in either solution or emulsion of either methacrylic or acrylic acid ester of dibutyl tin has produced elastomers with typical rubber properties at the Army Quartermaster Research & Engineering Laboratories, Natick, Mass. J. C. Montermosos and others from the Quartermaster Laboratories reported this achievement at the April meeting of the Polymer Division of the American Chemical Society.

The polymers produced vary from viscous oils to tough, rubbery materials, depending on the monomer, catalyst, and polymerization system used. The products are chain-type vinyl polymers with carbon-to-carbon connecting links and with the carboxyl-tin group attached to the chain in a pendant position.

Two series of polymers were made, one with methacrylic monomer, the other with acrylic monomer. The acrylic polymers were softer and less tough than the methacrylic polymers.

Many commercial elastomers have been developed from organo-silicon derivatives, and tin resembles silicon in some reactions and has good possibilities for polymer formation, it was said. Although dialkyl and diaryl derivatives of tin oxides are insoluble, infusible polymers, alkoxy and dicarboxylic acid derivatives of tin are similar in many ways to silicon and carbon compounds.

Tributyl tin oxide was first reacted with methacrylic acid in a one-to-one ratio to yield the monomer, methacrylic acid ester of tributyl tin oxide, in crystal form. Acrylic acid reacts with tributyl tin oxide in the same way.

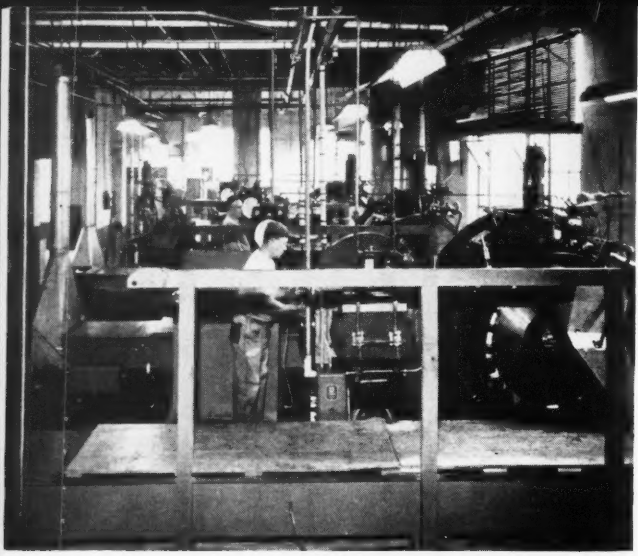


Fig. 1. Molding machine area at Stratford, Conn., plant of Ohio Rubber; machines are at right; discharge ends of conveyors at left

Ohio Rubber's Automatic Molding Process

THE Ohio Rubber Co. has just placed in operation (at its Stratford, Conn., plant) a completely automated process for high-precision, high-volume, molded rubber goods, without the premium price normally associated with precision molding. This process is highly mechanized and goes a long way toward "automation"—at least as far as the molded goods industry is concerned. The equipment used in the new Ohio Rubber continuous molding process requires an operator only to keep the molding machine supplied with compounded stock and to remove containers of finished product (see Figure 1).

Ohio Rubber acquired the basic concept and process from the Gora-Lee Corp. and has, through research and development, brought it to its present high degree of versatility and perfection. The new process can precision mold small rubber parts (up to 1¼-inch diameter and one inch thick), in a wide range of durometer hardness, at rates as high as 200,000 pieces per day. Parts already in production include seals for automotive shock absorbers and universal joints, washers for water conditioner quick-connectors, end caps for electrical condensers, aerosol container valve parts, engine valve stem deflectors, and fastener components.

Dimensional accuracy coupled with high production rates is an important engineering-economic feature of the Ohio Rubber process. Accuracy equal to or better than that obtainable by any other rubber molding process is now mere routine, Ohio Rubber claims, with its process. For example, a rubber seal used on automotive universal joints (see Figure 2) has all dimensions held within ± 0.005-inch, except for the internal land, which is held within ± 0.0025-inch in width and ± 0.003-inch in height.

The relation between product size and standard engineering tolerances is given in "Rubber Handbook—Specifications for Rubber Products," published by The Rubber Manufacturers Association, Inc. This rubber seal is, according to RMA specifications, a Class I (tightest tolerances) molding and a good example of the new molding process capability.

Each machine consists of a two-roll mill integrated with rotating molding equipment (see Figures 3 and 4).

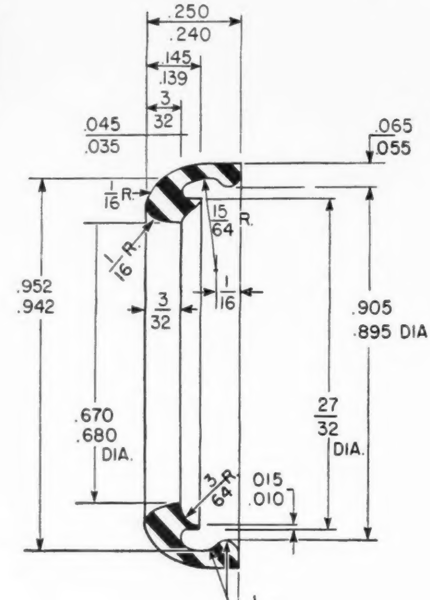


Fig. 2. Drawing of precision molded rubber seal

The molding section consists of two vertical 48-inch wheels on a common axle, spaced several inches apart. The outboard wheel normally mounts the mold cavities, and the inboard wheel holds the force plugs. This design uses fixed female mold cavities and movable force plugs; the latter are mounted on trunnions extending through the inboard wheel and activated by spring-loaded toggles.

In effect, each unit (mold cavity and force plug) is an individual mechanical press with a self-registering, single-cavity mold. With full tooling, there are 104 single-cavity molds on each machine. Each mold goes through a complete molding cycle during each revolution of the wheel. Opening, closing, and "bumping" of the molds are controlled by a stationary cam, on which the follower of each mold toggle rides. The molds close and are held by toggle-action against precisely set spring pressure.

The two-roll mill is periodically fed compounded stock by the operator; all other operations are continuous and automatic. Rotary knives cut a continuous strip of stock from the mill rolls, which is then fed over a closed loop of rollers, through the molding machine,

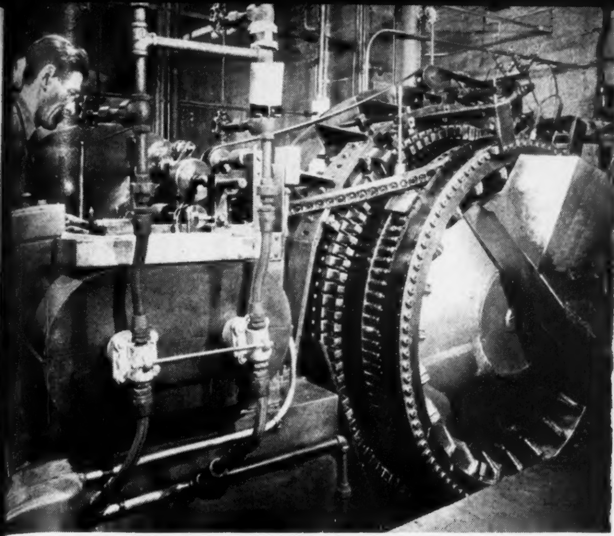
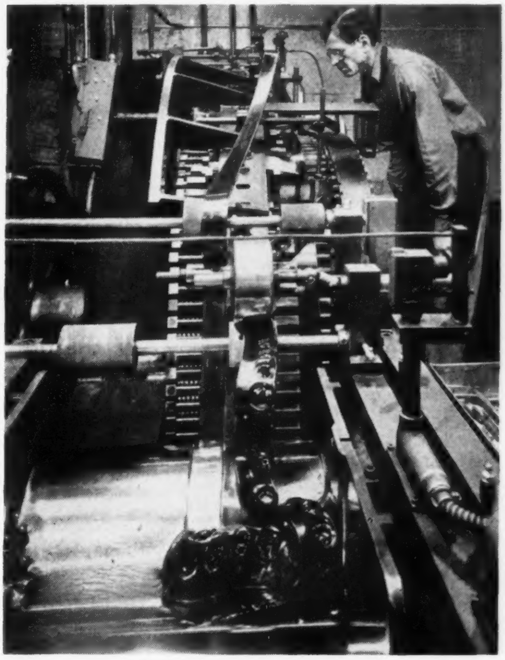


Fig. 3. Close-up of Ohio Rubber's continuous automatic rubber molding machine

Fig. 4. View of molding machine with mill in foreground and rotary molding section in background



and back to the mill bank. Within the molding machine the uncured rubber strip is fed between the open mold halves so that each mold bites off the exact volume of rubber it needs from the moving strip as it closes. The production rate of a 48-inch machine normally ranges from 40,000 to 200,000 pieces per day, depending upon size, shape, and curing time of the pieces being molded.

The process is best suited to relatively small parts which are produced in large quantities. In this respect Ohio Rubber estimates that an annual production of a million or more pieces will normally be required to justify the tooling cost and set-up of this new process.

The plant at Stratford, Conn., at the present time has 10 of the 48-inch machines, plus several smaller machines of more limited capability. Production rate depends upon the size and the shape of the part and the type of material and also the required curing time.

Many low-grade compounds used in low-cost molded parts require long curing time so that the machine would have to be slowed to accommodate them. Since the low cost of automatic production results from high machine output, this reduction might make the process uneconomical for parts made of such materials. In the case of many such inexpensive parts, however, Ohio Rubber compounders will be able to develop alternate compounds which can be molded at high production rates and which will be low enough in cost so that overall savings will result, it was said.

Airsprings and Their Applications

(*Continued from page 570*)

to be unusable from the standpoint of manufacture, flexing life, performance, growth, burst or stability.

Suspension Applications

Figures 14 through 16 illustrate the adaptability of the airspring to a few of the various types of conventional automotive suspensions. These include: independent front end with a lever ratio of about 2:1 on the airspring, Figure 14; torque-tube drive rear suspension, Figure 15; and tandem-axle truck rear suspension, Figure 16.

Although airsprings are presently being incorporated into conventional suspension designs, there is considerable activity under way to design new and novel suspensions around them in such a way that their advantages can be exploited to the fullest extent.

As a by-product of the air suspension, we may expect to see an increasing number of automotive components become air-operated. This may include such things as power brakes, power steering, windshield wipers, seat adjusters, and window actuators.

International Hardness Standard

An international standard for the determination of the hardness of rubber, recommendation R48 of the International Organization for Standardization (ISO), has been approved as a draft recommendation by representatives of 26 nations, including the United States.

This ISO Recommendation is available in the United States from the American Standards Association, New York, N. Y., a federation of 116 trade and professional associations and the United States clearinghouse for national standards.

NEWS of the

RUBBER WORLD

The Office of Defense Mobilization's long-drawn-out review of United States strategic stockpile policy was concluded in June with 14 "new" policies ordered by Defense Mobilizer Gordon Gray, the result of which was to maintain the situation at about status quo. This action confirms last month's observation that no change is contemplated in the natural rubber stockpile.

The International Rubber Study Group, at the conclusion of its Hamburg, Germany, June meeting, estimated natural rubber production and consumption about in balance at 1,920,000 tons and synthetic rubber consumption at 1,237,000 tons for a total of about 3,157,000 tons for the world this year.

The Federal Trade Commission's long-awaited guides to tire advertising, to become effective August 27, have been announced. In brief, the guides call for tire manufacturers and dealers so to advertise and label tires that a buyer will not be misled as to the quality of any brand he purchases.

The Committee for Economic Development in its recent publication of "Problems of United States Economic Development - Volume 2" has provided a wealth of ideas from industry and university economists and others on the most important economic problems to be faced by this country during the next 20 years.

The Rubber Manufacturers Association's Rubber Footwear Division is closely analyzing the language of several recommendations that are being drafted by the U. S. Tariff Commission for revision of tariff schedules in view of possible effect on footwear and other rubber products, with special reference to what is a "rubber."

The Goodyear Tire & Rubber Co. reports that airplane tires of either natural or synthetic rubber are feasible for atomic powered aircraft if nitrogen is used in place of air for inflation. The nitrogen, in diffusing through the tire, forms a protective cloak around the cords, thus preventing their degradation. Materials tested included natural and various other elastomers and nylon, rayon, Dacron, and other tire cord materials.

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MEETINGS

and REPORTS

Rubber Division Chicago Program Includes Goodyear Medal Award

The seventy-fourth meeting of the Division of Rubber Chemistry of the American Chemical Society will be held as a part of the fall meeting of the Society in Chicago, Ill. The Rubber Division will meet on Wednesday, Thursday, and Friday, September 10, 11, and 12, and the headquarters hotel will be the Sherman.

This Division meeting will be featured by presentation of the Charles Goodyear Medal for 1958 to Joseph C. Patrick, discoverer and pioneer in the production of Thiokol polysulfide rubbers. There will also be the usual luncheon-meeting on September 10 of the Division's 25-Year Club. There will be no plant trips, and the program for ladies will be handled by the parent Society.

R. F. Dunbrook, Firestone Tire & Rubber Co., chairman of the Division, will preside at the first technical session on the afternoon of September 10, at the business meeting of the Division on the morning of September 11, and at the Division banquet on the evening of the same day. Papers at the first technical session will cover analytical methods, pigments, and properties and subjects of general interest.

Division vice chairman, E. H. Krismann, E. I. du Pont de Nemours & Co., Inc., will preside at the second session on the morning of September 11, when papers on vulcanization and deterioration and of general nature will be presented. The Charles Goodyear Medal Award Lecture by Dr. Patrick entitled "Comments on Polysulfide Elastomers," will conclude this session. The business meeting during this second session will also include presentation of the award for the Best Paper presented at the May Cincinnati meeting.

S. C. Nicol, Goodyear Tire & Rubber Co., director-at-large, will preside at the third session on the afternoon of September 11. Papers at this session will deal with high-temperature resistance of elastomers and again with subjects of general interest. A. E. Laurence, Phillips Chemical Co., chairman of the local arrangements committee, will preside at the final session on the morning of September 12, at which time papers on new elastomers, adhesives and general subjects will be given.

The suppliers' cocktail party will be held on the evening of September 11 in the main ballroom of the Hotel Sherman. The Division banquet in the same place during the evening of September 11 will include the presentation of the Charles Goodyear Medal to Dr. Patrick and an entertainment program. There will be an opportunity to buy tickets for the banquet in advance of arrival in Chicago.

Members of the local committee and their responsibilities, in addition to the chairman, Mr. Laurence, include: V. J. La Brecque, Victor Gasket & Mfg. Co., vice chairman; S. F. Choate, Tumpeer Chemical Co., in charge of finance; L. W. Heide, Acadia Synthetic Products Division, Western Felt Works, printing; J. P. Sheridan, New Jersey Zinc Co., and R. R. Kann, Goodyear, banquet co-chairmen; H. D. Shetler, Chicago Rawhide Mfg. Co., program and meeting rooms; J. Groot, Dryden Rubber Division, Sheller Mfg. Corp., housing; Robert Varick, Fred A. Jensen & Associates, registration; J. E. Stonis, C. P. Hall Co. of Illinois, ladies' entertainment; H. E. Minnerly, Jr., B. F. Goodrich Chemical Co., transportation; M. J. O'Connor, O'Connor & Co., Inc., publicity; and F. P. Steitz, J. M. Huber Corp., information.

Program and Abstracts of Papers

Wednesday Afternoon—September 10
General Papers, Analytical Methods, Pigments, and Properties
R. F. Dunbrook, Presiding

2:00 p.m.—1. Introductory remarks. R. F. Dunbrook.

2:05 p.m.—2. The Determination of Zinc Oxide in Rubber Vulcanizates by X-Ray Diffraction. M. P. Wagner,[1] S. H. Laning, and J. W. Sellers, research laboratories, Columbia-Southern Chemical Corp., Barberton, O.

The need of a rapid non-destructive analysis for zinc oxide in rubber vulcanizates prompted the consideration of the X-ray techniques. Diffraction patterns from the surface of the sample were found to give reliable correlation with the concentration of zinc oxide in the sample. The experimental procedure and treatment of the data will be discussed.

Application of this technique to some typical filled sulfur rubber vulcanizates indicated that, while zinc oxide is necessary for the production of cross-links, consumption of zinc oxide is independent of the amount and type of reinforcing filler.

2:25 p.m.—3. Semi-Micro Determination of Free Sulfur in Cured Rubber Stocks. Roger W. Strassburg, general chemical laboratories, The B. F. Goodrich Co., Akron, O.

Our method of finding the state of cure of a vulcanized rubber sample is based on a determination of the free sulfur content. Since dissection of rubber products often requires that very small samples be analyzed, the method can be utilized on amounts of material between 15-50 mg. Free sulfur in the sample is allowed to react with sodium sulfite to produce sodium thio-sulfate which is then titrated with standard iodine solution after removal of excess sulfite. The accelerator tetramethylthiuram disulfide interferes with this analysis, and the method is not applicable if it is present.

Sample preparation was found to exert considerable influence on the accuracy and precision of the analysis. Accuracy depends on the extent of subdivision of the sample because the extraction with sodium sulfite will be less complete for larger pieces of rubber. Precision depends on the uniformity both of sample subdivision and sulfur content. A comparison between samples sheeted on a standard rubber mill and granulated to uniform size in a semi-micro Wiley mill after freezing with solid carbon dioxide shows improvement in both accuracy and precision by the latter method. Processing the rubber without treatment with solid carbon dioxide causes much difficulty in handling and the loss of free sulfur by further vulcanization during the resultant frictional heating. A study of sample subdivision indicates there is an optimum mesh size which provides for both ease of handling in the analytical procedure and completeness of extraction.

Techniques which allow the free sulfur content of a part of a tire to be determined without destroying the tire will be illustrated. The simplicity and speed of the semi-micro free sulfur method will be demonstrated in a 16-mm. movie of the actual operation.

2:45 p.m.—4. The Determination of

[1]Names in bold face indicate person presenting paper.

Free Sulfur in Accelerators. R. A. Hively and **C. W. Wadelin,** research division, Goodyear Tire & Rubber Co., Akron.

Several methods have been proposed for the determination of free sulfur in accelerators. Some of the methods can be applied in certain specific cases; but no general procedure is available for accelerators except, possibly, the isotope dilution method of Ikeda and Kambara. With this method it would be necessary to isolate the sulfur or a derivative in pure form, weigh the amount isolated, and measure its specific radioactivity. Mercaptans interfere in determinations based on the reaction of alkali cyanide with sulfur. A polarographic procedure is sensitive and accurate; but miscellaneous sulfides, disulfides, sulfenamides, etc. have reduction waves that interfere with the estimation.

This paper proposes a preliminary chromatographic separation of accelerators which interfere with the polarographic determination of sulfur. Accelerators are retained on an alumina column from benzene solutions, but free sulfur passes through. The polarographic method of Poulton and Tarrant is used to measure the sulfur by means of the wave whose half wave potential is —0.6-volt *vs.* the saturated calomel electrode. Either a recording or manual polarograph can be used as only a single current measurement is required for each sample. From 0.02 to 3.6% of free sulfur can be determined in 2-mercaptobenzothiazole, benzothiazyl disulfide, thiuram disulfides, dithiocarbamates, or sulfenamides. Approximately one hour is required for the determination.

3:05 p.m.—5. Accelerated Testing of Ozone Cracking Inhibitors. F. B. Smith and W. F. Tuley, development department, Naugatuck Chemical Division, United States Rubber Co., Naugatuck, Conn.

In the research program at Naugatuck Chemical both accelerated and unaccelerated tests are used to screen and select commercial ozone cracking inhibitors. Typical data from this work are shown, indicating the relative effectiveness of several commercial chemical antiozonants in tread and sidewall compounds. The proper use of waxes with these antiozonants is also illustrated.

It is demonstrated that the accelerated test may produce misleading results unless employed in conjunction with other more definitive tests. This variation may be explained in these terms: over-saturation of the rubber surface with ozone largely decreases the concentration of protective antiozonant in the rubber surface and ozone cracking occurs. Rate of renewal of antiozonant in the surface from the underlying layers is insufficient to rectify the initial loss in concentration. Under atmospheric conditions the concentration of ozone is generally much lower, and such marked decrease in the antiozonant concentration is not likely to occur.

In terms of actual product performance (i.e., tires) the most informative tests are shown to be the outdoor dynamic cracking test and the outdoor wheel test. These tests show that N-phenyl-N′ cyclo-hexyl p-phenylene diamine produces substantially greater inhibition of ozone cracking than other commercial chemical antiozonants.

3:30 p.m.—6. The Formation of Volatile Fatty Acids in Ammonia-Preserved Natural Latex Concentrate. J. S. Lowe, Dunlop Research Center, Dunlop Malayan Estates, Ltd., Malacca, Malaya, and **J. A. Carr,** Dunlop Research Center, Toronto, Ont., Canada.

Measurement of volatile fatty acids present in ammonia-preserved natural latex is of importance in judging the degree of preservation of such latex. It is comparatively easy to produce a latex of low VFA content but it is another matter to insure that the latex reaches the consumer with a VFA of low level or even of constant level from shipment to shipment.

The formation of volatile fatty acids in ammonia-preserved natural latex concentrate has been studied, and the results show that the following factors contribute to their formation:

a. The quality of the field latex, the level of bacteria population in the latex, and the length of time they have been allowed to remain viable in the latex.

b. The amount of serum substrate available for the enzymic process.

c. The degree of inhibition exerted by the level of ammoniation.

d. The reduction-oxidation potential of the latex.

Data are presented supporting these conclusions, and some of the controlling factors are discussed.

3:50 p.m.—7. Important Quality Factors in Styrene-Butadiene Rubber (SBR) as Affected by Stabilizers and Flocculation Techniques. B. A. Hunter, A. C. Nawakowski, R. R. Barnhart, E. B. Hansen, E. M. Campbell, Naugatuck Chemical development department.

Adequate stabilization of SBR polymers demands careful consideration if maximum quality is to be obtained. Improperly stabilized SBR readily undergoes heat degradation during manufacture in the polymer plant and also during hot processing operations in the subsequent manufacture of the finished product. Heat degradation is evidenced in polymer discoloration, resinification, changes in Mooney viscosity, and eventual gel build-up. These effects are reflected in the processing characteristics of the raw polymer and also in the quality of the final vulcanizate. Oil-extended polymers are especially susceptible to heat degradation. The proper selection of an effective stabilizer is of particular importance in these polymers.

Commercial SBR stabilizers vary considerably in their influence on the heat stability and processing characteristics of the polymer. Certain phenolic types exert a peptizing action which may promote breakdown of the polymer. The non-discoloring aryl phosphite-type stabilizer is effective in preventing Mooney fluctuations and gel build-up in hot processed polymers and has wide applicability in both conventional and oil-extended types.

Data are presented which illustrate the adverse influence of excessive usage of sodium chloride as a flocculating agent. The advantages of the acid-glue flocculation technique, as compared to the conventional salt-acid procedure, are apparent in the improved heat stability of acid-glue flocculated polymers. Corresponding superiority in the physical properties of vulcanizates of the acid-glue polymer is evident when the uncompounded polymer is subjected to high-temperature processing conditions.

The relation between polymer instability and the presence of certain metallic ions (specifically iron) is re-emphasized in the present work.

4:10 p.m.—8. Kinetics of Filler-Polymer Interaction between Fine Particle Silica, or HAF Carbon Black and SBR or Butyl Rubber. Melvin P. Wagner and John W. Sellers, Columbia-Southern Chemical Corp.

The thermal interaction of various fine particle silicas, calcium silicate, and HAF carbon black with SBR or butyl rubber was examined kinetically. The reaction of fine particle silica and HAF blacks followed zero order kinetics with an activation energy sufficiently high (17 $\pm$3 kcal./mole) to indicate that a chemical reaction (as contrasted to purely physical adsorption) was involved. In line with its indicated chemical nature, filler-polymer interaction was found to be irreversible. Cold milling techniques revealed that fine particle silica was as good a free radical acceptor as HAF carbon black. The kinetics of the filler-polymer gel development were not altered with the use of an esterified fine particle silica.

Like graphatized channel black, calcium silicate showed no temperature coefficient of filler-polymer interaction. Modern theory suggests that reinforcement mainly is a result of chemical interactions between filler and elastomer during vulcanization. These experimental results, then, show the potential of fine particle silica to participate effectively in filler-polymer interactions equal to high efficiency reinforcing carbon blacks.

4:30 p.m.—9. The Organic Nature of Carbon Black Surfaces—II. Quinones and Hydroquinones by Coulometry at

Controlled Potential. J. V. Hallum and H. V. Drushel, Mellon Institute of Industrial Research, University of Pittsburgh, Pittsburgh, Pa.

A quantitative method for the determination of quinone oxygen and hydroquinone hydroxyl on the surface of carbon blacks by coulometric reduction or oxidation is described. This method consists of suspending by means of stirring, a sample of carbon black in a solution of dimethylformamide and the electrolyte. This slurry is then electrolyzed at constant potential using compartmented cells to prevent reverse reactions from occurring. The number of coulombs required for the reaction, whether oxidation or reduction, is determined by graphic integration of the current-time curve from the recorder. The compartmented cells used provided controlled hydrodynamic conditions so that the reactions proceeded at a reasonable rate with reproducible results.

The number of coulombs of electricity (Q) consumed for either oxidation or reduction is given by the equation

$$Q = (i\text{-}i_{lim})\ dt,$$

where i is the current in amperes, i_{lim} is the limiting current in amperes, and t is the time in seconds. From this, the weight % of quinone oxygen is calculated by means of the equation

$$\%\ \text{Quinone O} = \frac{Q(16.00)\ (100)}{n(96{,}500)\ (\text{sample weight})}$$

where n is the number of electrons transferred in the electrode reaction. Similarly, the weight % of hydroquinone hydroxyl is calculated as follows:

$$\%\ \text{Hydroquinone OH} = \frac{Q(17.01)\ (100)}{n(96{,}500)\ (\text{sample weight})}$$

The control potential and n were determined on the basis of previous polarographic studies.

The results obtained were reproducible with either five- or ten-gram samples and varied according to the nature of the black from essentially zero to a high of 1.020% quinone oxygen and from zero to 0.344% for hydroquinone OH.

4:50 p.m.—10. The Sorption of Benzene by Natural and Synthetic Polymeric Hydrocarbons. Paul Fugassi and George Ostapchenko, Coal research laboratory, Department of Chemistry, Carnegie Institute of Technology, Pittsburgh, Pa.

The sorption of benzene on natural and synthetic hydrocarbon polymers has been measured at 45° C. using a gravimetric method employing McBain-Bakr spring balances. The sorption of benzene on these polymers is isothermally reversible. Measurements were made on the following hydrocarbon polymers: natural rubber; balata; polyisobutylene; *cis,* 1-1 polybutadiene; polyethylenes; polypropylenes; and polystyrenes. Measurements have been limited to relative pressures between 0.2 and 0.9. Spring balances have relatively low precision at low relative pressures because of low sorption. At very high relative pressures corrections are necessary for the adsorption of benzene on the spring and on the glass bucket carrying the sample. Such corrections are negligible at relative pressures lower than 0.9.

Over this range of relative pressures, the experimental results have been fitted to a sorption isotherm of the form

$$\frac{c}{W_e} = \frac{1}{AK} + \frac{K\text{-}1}{AK}\, c$$

In this equation, W_e is the equilibrium sorption in moles of benzene per gram of polymer; A is moles of internal sites per gram of polymer; K is an equilibrium constant (dimensionless); and c is the relative pressure or the pressure of benzene divided by the vapor pressure of benzene at 45° C. This equation is a special form of a more general equation derived by us from kinetic considerations for the sorption of polar vapors, such as water, by polar gels such as polysaccharides, proteins, and coal.

It has been found that the value of A can be calculated if the polymer has a known structure and if rotation about individual carbon-carbon bonds is free. Anything which hinders such rotation such as cross-linking or order will give lower values of A. The experimental determination of A for a given polymer sample of known structure will permit the estimation of the amount of order present in such a sample.

Thursday Morning—September 11
General Papers, Vulcanization and Deterioration
E. H. Krismann, Presiding

9:00 a.m.—11. Radiation Vulcanization of Elastomers. Dale J. Harmon, The B. F. Goodrich Co., Research Center, Brecksville, O.

Radiation cure studies were made on carbon black reinforced styrene-butadiene rubber (SBR), nitrile-butadiene rubber (NBR), chloroprene rubber (CR), and natural rubber (NR) compounds, and optimum cures determined. Static and dynamic measurements were made as well as ozone cracking and oxidation rates and elevated temperature stress-strain and test tube aging measurements, and the results were compared with those of chemical cures of the same elastomers. The effect of temperature on the curing rates as well as the effect of adding antioxidant to the radiation cured compounds was examined. A comparison was made between compounds cross-linked by exposure to gamma rays from Cobalt 60 and high-speed electrons from a 2 MEV Van de Graaff generator.

It was found that the static and dynamic properties of the radiation cures were similar to those of the chemical cures. The stress-strain properties of the radiation cures most resemble those of peroxide cures. In general, the radiation cures were found to have higher heat stability, equivalent ozone resistance, and higher oxidation rates. Heat was found to accelerate the radiation cross-linking of NR. The addition of an antioxidant results not only in improved heat stability, but also in an improvement in initial stress strain properties.

9:20 a.m.—12. Heat, Ozone, and Gamma Radiation Stability of Highly Saturated Adduct Rubber Vulcanizates. G. E. Meyer, F. J. Naples and H. M. Rice, Goodyear, research division.

In further aging-stability studies on the recently described adduct elastomers,[2] highly saturated (more than 80%) methanethiol adducts of emulsion polybutadiene have been evaluated under more severe conditions than heretofore. These potentially low-cost specialty rubbers have outstanding resistance to the degradative effects of ozone, high temperature, gamma radiation, etc.

Handling, processing and vulcanization procedures for the adducts are essentially the same as for SBR. Also, as in the case of SBR, curing recipes containing little or no free sulfur generally produce stocks having the best resistance to aging at elevated temperatures.

Very highly saturated adducts, containing no added antiozonant, show extraordinary ozone resistance; for example, a black loaded tread-type stock exhibited no cracking upon exposure to 10,000 phm. ozone for more than 200 hours. Under the same conditions, Enjay Butyl 218 and Neoprene WRT cracked in less than 20 hours and one hour, respectively. Suitably vulcanized adducts appear at least equivalent to resin-cured butyl rubber in curing-bladder stocks tested under simulated production contitions.

9:40 a.m.—13. Chemical Loaded Molecular Sieves As Latent Curing Aids —II. Accelerators for Vulcanization of Neoprene. F. M. O'Connor, T. L. Thomas, Linde Co., Division of Union Carbide Corp., Tonawanda, N. Y.

Neoprene formulations, like most rubber compounds, are processed at elevated temperatures. During this processing, premature vulcanization or "scorch" is a serious problem, particularly when accelerators are used to speed up the rate of cure. Ideally,

[2]Rubber World, July, 1957, p. 529; Aug., 1957, p. 695.

the accelerator should be inactive during the various stages of processing, such as mixing and extruding, but should be available during vulcanization to promote a rapid cure. The combination of a Linde molecular sieve with compounds which are powerful accelerators for neoprene vulcanization produces such an acceleration system. These materials are unique, temperature-sensitive accelerators.

Compounds such as catechol and diethyl thiourea have been combined with molecular sieves to produce accelerators which offer very rapid cure rates while maintaining good processing safety. Considerably improved Mooney scorch times over those obtained with catechol and diethyl thiourea alone are obtained in both the W types and the G types of neoprene. These accelerators are useful in neoprene formulations containing the commonly used reinforcing fillers including carbon black, clay, and natural whiting.

The combination of diethyl thiourea and molecular sieves, which gives safe-processing, rapid-curing stocks, is particularly useful when the vulcanizate requires good aging characteristics. Catechol loaded molecular sieves offer compounds which combine extra-long Mooney scorch times with rapid vulcanization.

10:05 a.m.—14. Molding of Resilient Urethane Foam. R. E. Knox, elastomer chemical department, E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

Resilent urethane foams are becoming increasingly more important as cushioning materials in the automotive and furniture fields. Articles of desired shapes and sizes can be made by molding to shape during the foaming reaction using a predetermined mold. They may also be postformed from slab foam by contour cutting or heat forming operations.

Advances in processing methods particularly in molding, have kept pace with the marked improvements in urethane foaming systems. This paper gives a brief review of the fundamentals pertaining to the molding of solid and cord items and discusses the more important variables involved in this operation.

The methods developed for eliminating some of the difficulties and deficiencies encountered in earlier molded articles of urethane foam, such as skin coarseness, cellular irregularity, non-uniformity of density, hard edges, surface marking, pneumaticity, and slow recovery from deformation, will be discussed. Additionally, the important economic factors that enter into any comparison of the relative merits of molded *vs.* slab production, such as density and scrap losses, will be reviewed.

10:25 a.m.—15. Degradation of Polyisoprene Networks by Oxygen. E. M. Bevilacqua, U. S. Rubber Research Center, Wayne, N. J.

Volatile products of the oxidation (at 120° C.) of natural rubber vulcanized in two distinct ways are identical with those obtained from raw rubber. Rates of oxidation of the vulcanizates are similar, but faster than that of raw rubber. Solubility and swelling after oxidation are not affected by the nature of the cross-linking agent. Differences between the oxidation of vulcanized and raw rubber must be traced to some feature common to vulcanizates containing carbon-to-carbon and carbon-to-sulfur bonds in the cross-link, and external to the cross-link itself.

10:45 a.m.—16. Wing-Stay 100 as an Antioxidant and as an Antiozonant. R. B. Spacht, W. S. Hollingshead and J. G. Lichty, Goodyear research division.

The properties of Wing-Stay 100, a mixed diaryl-p-phenylenediamine, are described. This age resister is a low melting solid approximately three times as soluble in rubber as diphenyl-p-phenylenediamine.

This age resister, like diphenyl-p-phenylenediamine, is especially effective in carbon black reinforced stocks. Superior resistance to oxidative degradation and flex-cracking is demonstrated by incorporation of the mixed diaryl-p-phenylenediamine in vulcanized natural rubber tread stock.

Wing-Stay 100 is an excellent stabilizer for discoloring types of polymers such as SBR-1000, 1502, and 1712. As little as 0.50 to 0.75% in raw polymers gives superior resistance to oxidation, as compared to the usual 1.25 parts of phenyl-beta-naphthylamine.

Wing-Stay 100 uniquely combines a number of the very desirable properties found in other commercially available antiozonants. Since this product is a mixture, a combination could be selected which makes this possible. For instance, this new product has low volatility. This is a decided advantage in articles known to operate at temperatures over 200° F. and results in a longer useful life for the antiozonant. Secondly, this mixed diaryl-p-phenylenediamine does not activate the cure, as is commonly encountered among the better antiozonants.

11:05 a.m.—Business Meeting. Best Paper Award.

11:? a.m.—17. Comments on Polysulfide Elastomers. J. C. Patrick, Thiokol Chemical Corp., Trenton, N. J. 1958 Charles Goodyear Medal Award Lecture.

Thursday Afternoon—September 11
General Papers, High-Temperature Resistance
S. C. Nicol, Presiding

2:00 p.m.—18. Transition Behavior of Polychloroprene and Polychloroprene/SBR Blends. R. M. Kell, B. Bennett, and P. B. Stickney, Battelle Memorial Institute, Columbus, O.

The chloroprene polymers have limited application at low temperatures because of the ease with which they crystallize. In an investigation of this problem, dilatometric studies have been carried out to determine crystallization rates, melting ranges, and the effect of vulcanization for various polychloroprenes.

A typical polychloroprene (Neoprene W) was also blended with 10, 20, and 30 phr. of a styrene-butadiene rubber (SBR) and studied over a temperature range including the glass and melting transitions. The glass transition temperature of the pure polychloroprene was lowered from —41 to —50° C. by 30 phr. of SBR-1500. The added SBR-1500 retarded the rate and ultimate degree of crystallization somewhat. The maximum rate of crystallization occurred near —5° C. for pure Neoprene W, Neoprene WRT, and for blends of Neoprene Type W with SBR-1500.

Glass transition temperatures were compared with brittle point measurements in evaluating the low-temperature performance of chloroprene polymers.

2:20 p.m.—19. The Dynamic Properties of Elastomers Measured Continuously with Temperature. A. D. Dingle and N. S. Grace, Dunlop Research Center, Toronto.

A clear knowledge of dynamic properties is essential to the intelligent use of rubber compounds in dynamic service. It is well known that products subject to severe dynamic use, such as tires, rapidly heat up in service and that the rate of heating depends upon the compounds used in the tire, particularly on the choice of elastomer. It is also accepted that the dynamic properties of the materials used will change as a result of the changes in temperature during service. Hence the dynamic properties must be determined over the anticipated operating temperature range.

The Dunlop rotary resilience machine has been used to determine the dynamic properties of modulus, resilience, and power loss as continuous functions of temperature. Elastomers tested have included natural rubber, styrene-butadiene, butyl and urethane rubbers; reinforcing fillers varied in both loading and type have been tested; plasticizers, extending oils, and method of cross-linking (peroxide *vs.* sulfur) have also been studied.

Curves relating the important dynamic properties with temperature over the range —40 to 200° C. will be shown. The practical importance of the results are discussed as well as the critical temperatures of resilience. The effects of frequency and amplitude on the properties are also considered.

2:45 p.m.—20. Effect of Compounding or Processing Variations on the High-Temperature Properties of Hevea and Butyl Rubbers.[3] F. M. Smith and W. A. Smith, research laboratories, Firestone Tire & Rubber Co., Akron.

Curing systems believed to give predominantly monosulfide, disulfide, and tetrasulfide linkages and carbon-to-carbon linkages in *Hevea* compounds were evaluated with respect to high-temperature tensile properties. Blends of *Hevea* with balata, types and amounts of three antioxidants, and variation of major filler loading in *Hevea* were also investigated as a means of improving the heat resistance. No major improvement was attained by any of these means.

Improvement in the heat-resistant properties of three butyl cure variations was sought by dynamically heat treating butyl-silica and butyl-MPC black masterbatches. Highest test temperature was 500° F. The heat treatment was beneficial to the silica stocks; detrimental to the carbon black stocks.

3:10 p.m.—21. Heat Resistance of a Chlorine-Containing Copolymer of Isoolefin and Multiolefins. D. J. Buckley and R. E. Clayton, chemicals research division, Esso Research & Engineering Co., Linden, N. J.

Modern rubber technology requires practical polymer vulcanizates which resist degradation during severe exposure to very high temperatures. This is a major consideration in the establishment of MD-551, a chlorine-containing copolymer of isoolefin and multiolefins.

This polymer has low chemical unsaturation of the order of 1% as desired for relative inertness to degradation. Its reactivity with respect to vulcanization is increased markedly by about 1.2% chlorine, in the highly active allylic position. The nature of the cross-link associated with the presence of chlorine contributes strongly to the heat-resistance of vulcanizates of this polymer.

MD-551 is a multi-purpose rubber with respect to the various formulation and production aspects of its utility. Examples dealt with in this paper comprise specific compounding and property features of chlorobutyl that can be applied to various heat-resistant applications.

3:35 p.m.—22. The High-Temperature Properties of Elastomers Containing Carboxyl Groups. Robert A. Hayes, Firestone research laboratories.

Outstandingly high tensile strengths and elongations at 400° F. are obtained from butadiene-methacrylic acid copolymers vulcanized with epoxy resins in conjunction with various metal oxides. In a copolymer containing 15% methacrylic acid it has been shown that the high-temperature properties improve greatly with increasing metal oxide content until an equivalent amount of oxide is added. Barium and magnesium oxides produce stocks stiffer and stronger than those containing zinc or cadmium oxides. Reduction of the acid content of the copolymer to as little as 3% causes a considerable increase in flexibility and elongation and only a slight decrease in tensile strength. For example, a black filled polymer containing only 3% methacrylic acid and vulcanized with Epon 828[4] and magnesium oxide has a tensile strength of 400° F. of 825 psi. and an elongation of 260%.

Aging data on these carboxy rubbers shows that they are considerably better than conventionally cured diene polymers as well as being very superior in their properties at high temperatures.

It is shown that the severe processing difficulties encountered with the carboxy polymers can be greatly eased by an *in situ* hydrolysis of a butadiene-methylmethacrylate copolymer with barium hydroxide octahydrate. Such polymers have the same good high-temperature properties as those prepared from butadiene and methacrylic acid.

3:55 p.m.—23. Compounding "Viton" Fluoroelastomer for High-Pressure, High-Temperature Applications. G. A. Gallagher, T. D. Eubank, and A. L. Moran, Du Pont elastomer chemicals department.

"Viton" A fluoroelastomer, a copolymer of vinylidene fluoride and hexafluoropropylene, is designed for exceptionally high-temperature service. It retains its elastomeric properties in the temperature range of 400 to 600° F. and in addition has excellent resistance to most fluids both at room and elevated temperatures. Early attempts, however, to utilize "Viton" A for high-pressure, high-temperature hydraulic hose applications uncovered a blistering phenomenon which limited its utility. The hose blistering phenomenon will be described, and a mechanism proposed based on a simulated blistering test.

Studies utilizing this test will be presented, and preferred methods for avoiding the blistering will be discussed.

4:15 p.m.—24. Safe-Processing Curing Systems for "Viton" Fluoroelastomers. A. L. Moran, R. P. Kane, and J. F. Smith, Du Pont elastomer chemicals department.

The first curing systems for "Viton" A involve cross-linking by means of polyfunctional amines such as triethylene tetramine or peroxides such as benzoyl peroxide. While both of these systems produce good vulcanizate properties, they are somewhat impractical owing to poor processing safety.

Blocked diamines, such as amine carbamates, are known to produce safer processing stocks, as judged by conventional Mooney scorch tests.

Evidence will be presented to describe other curing systems which offer even safer processing methods.

4:35 p.m.—25. Banbury Processing Characteristics of SBR and NBR Rubbers. K. C. Beach, V. E. Lowery, and L. F. Comper, Goodyear.

Laboratory Banbury mixing characteristics of various types of SBR and NBR rubbers are described. By using a simple HAF black reinforced formulation, reproducible Banbury power consumption curves characteristic of each type of rubber were obtained. Empirical measurements on rates of black pigment incorporation by the rubbers were obtained from the Banbury power consumption curves.

Effect of Banbury ram pressures, revolutions per minute, and batch sizes on rate of black pigment incorporation by an oil-extended SBR rubber are described.

A simple and rapid test based upon Banbury black incorporation rates has been used as a quality control test at the polymer plant to insure uniformity in processing of each of the Plioflex styrene-butadiene rubbers. Banbury black incorporation rates have also been found useful in evaluating the effect of polymerization variables on processing characteristics of SBR and NBR rubbers.

6:45 p.m.—Division Banquet.

Friday Morning—September 12
General Papers, New Elastomers, Adhesives
A. E. Laurence, Presiding

9:00 a.m.—26. A Comparison of Tack Testing Methods for Pressure-Sensitive Tape. Franklin S. C. Chang, Mystik Adhesive Products, Inc., Northfield, Ill.

The peeling resistance of pressure-sensitive tape is influenced by a number of intrinsic factors, e.g., rheological property and thickness of adhesive film, and arbitrary factors, e.g., peeling speed, peeling angle, pressure applied. Based on consideration of these factors, a comparison of several tack testing methods for pressure-sensitive tape has been made. It was found that with no pressure applied, the peeling methods with plane adherend and rotating cylindrical adherend are practically the same. The rolling ball method, using inclined plane or curved track, operates at relatively high peeling rate and measures probably the upper limit of the resisting force, in which the flow property of adhesive plays a larger role than in other methods. The result of the Hercules probe method is very close in nature to ASTM Method D-1000 for strength when applied to pressure-sensitive tape.

For quality control, the most con-

[3] A major portion of this work was conducted under USAF Contracts Nos. AF 33(616)-3108 and AF 33(616)-3953 administered under the direction of the Materials Laboratory, Wright Air Development Center.

[4] Firestone Plastics Co., Pottstown, Pa.

venient are the peeling methods. The large number of testing readings required by the other methods to obtain representative data reduces their value for production control.

9:15 a.m.—27. Studies in Tire Cord Adhesion. A. L. Miller and S. B. Robison, Esso chemicals research division.

The complexity of the tire cord adhesion bond is well known. In this report attempts to delineate some of the variables are described. The principal adhesion system employed was a natural rubber latex-RFL dip in conjunction with a second dip of a bromine-containing isoolefin-multiolefin copolymer (MD-571) cement, containing carbon black. The doubly treated cord was then cured to a butyl rubber carcass stock, and adhesion was measured by the "H" test.

Our results indicate that the principal contribution to cord adhesion comes from the resorcinol-formaldehyde resin. The addition of the latex elastomer to the dip may enhance or detract from this RF adhesion, depending upon its olefin activity and concentration. Elastomers containing the isoprene monomer unit are more reactive than those containing the butadiene monomer unit.

Studies of the bromine-containing isoolefin-multiolefin copolymer (MD-571) cement composition indicate a strong adhesion dependence upon the activity of this elastomer, and there is a minimum bromine content for satisfactory adhesion in this system. Comparison of the bromine-containing isoolefin-multiolefin copolymer (MD-571) with its chlorine-containing counterpart (MD-551) indicates the former to be more reactive and results in higher cord adhesion.

9:40 a.m.—28. An Aqueous Blocked-Isocyanate "Dacron"-to-Rubber Adhesive—I. W. L. Thompson, T. B. Marshall, and A. T. Sweet, Du Pont "Dacron" research laboratories, Kingston, N. C.

The high modulus, dimensional stability, strength, and chemical and thermal stability of "Dacron" polyester fiber have made it an attractive candidate for use in mechanical rubber goods. One of the problems which has hindered major acceptance of this fiber in such applications has been that of inadequate "Dacron"-to-rubber adhesion, using existing aqueous adhesives.

The development of an aqueous adhesive for "Dacron"-rubber based upon the blocked-isocyanate principle is discussed. Several aromatic polyisocyanates and a limited number of blocking agents were investigated as adhesive components. A latex and a thickener constitute the remaining ingredients, and a screening of these components is presented. A study of the adhesive's properties regarding composition, curing conditions, curing by-products, dipped cord shelf-life, effects on fiber properties, and adhesion to various rubber stocks both static and dynamic are discussed.

Many of the familiar adhesion tests (H-pull, strip adhesion, CT fatigue, and dynamic adhesion) gave erroneous indications of the adhesive performance and were in general use for broad scouting. The final test was eventually an actual end-use test.

10:00 a.m.—29. An Aqueous Blocked-Isocyanate "Dacron"-to-rubber Adhesive—II. L. W. Parke, Du Pont industrial products research laboratory, Newport, Del.

The evaluation of an aqueous blocked-isocyanate adhesive (coded D-15) for improved "Dacron"-to-rubber adhesion in commercial applications, particularly V-belts, is discussed. The general properties, formulation, and preparation of the adhesive mixture, optimum cord dip stretching conditions and dipped cord properties are presented. Modifications to the adhesive for further improved adhesion, commercial processability and application in natural rubber (NR), styrene-butadiene (SBR), and chloroprene rubber (CR) systems are discussed.

An end-use evaluation was made to determine the commercial acceptability of the adhesive in V-belt applications. Data on adhesion, adhesion loss, and cord strength loss of D-15 treated "Dacron" reinforced V-belts are compared with data on commercial "Dacron" (resin latex dip) and rayon-reinforced belts.

10:20 a.m.—30. Cyanosilicone Elastomers—A New Class of Solvent-Resistant High-Temperature Rubbers. T. C. Williams, R. A. Pike, F. Fekete, Silicones Division, Union Carbide Corp., Tonawanda.

Oil-resistant elastomers capable of retaining useful properties for extended periods at elevated temperatures are of considerable interest in many fields. The discovery of thermally stable silicone polymers containing cyanoalkyl organofunctional groups has made possible a new class of solvent-resistant rubbers useful over the broad temperature range characteristic of the silicones.

The preparation of cyanosilicone elastomers is conducted by methods similar to those employed with conventional silicone elastomers. The amount of cyanoalkyl substitution in the polymer and the nature of the cyanoalkyl group is important in obtaining a high degree of solvent resistance over a wide temperature range. By proper selection of polymer composition, compound formulation and processing, cyanosilicone elastomers are obtained which are operable under severe environments where resistance to heat and oil is important. The general properties of cyanosilicone elastomers are presented in comparison to a number of silicone and organic rubbers. The industrial potential of cyanosilicone elastomers also is discussed briefly in this paper.

10:40 a.m.—31. The Stereospecific Polymerization of Isoprene with Lithium and Organolithium Compounds. R. S. Stearns and L. E. Forman, Firestone.

All of the alkali metals will catalyze the polymerization of dienes such as butadiene and isoprene. When, however, isoprene is catalyzed by lithium or organolithium compounds in the absence of oxygen-containing solvents, a stereoregular polymer is obtained. This polymer, Coral rubber, has molecular structure, configuration and physical properties similar to those of *Hevea* and contains 93-95% *cis*-1,4 and 5-7% 3,4 addition.

This stereospecific polymerization appears to proceed through a homogeneous catalytic mechanism irrespective of the solubility of the catalyst. It is suggested that stereoregularity is the result of a *cis* coordination complex formed between the monomer and the lithium atom on the terminal carbon atom of the growing polymer chain which undergoes a rearrangement to form a six-member cyclic activated complex. These complexes owe their relative stability to the ability of the lithium atom to undergo hybridization and to behave in many of its reactions as an atom having considerable divalent character.

The structure of the activated complex is supported by the observed effects of temperature and type of solvent on the degree of stereoregularity obtained during the course of the polymerization reaction. Small concentrations of Lewis bases such as ethers completely change the stereospecific aspects of the lithium catalyzed polymerization of isoprene. This effect is due to the coordination of the Lewis base with the carbon bound lithium atom thus interfering with the ability of the lithium atom to participate in the proposed cyclic activated complex. The degree with which various Lewis bases destroy the stereoregular aspects of the lithium polymerization can be correlated with the relative base strength of these compounds.

11:00 a.m.—32. *cis*-Polybutadiene-Natural Rubber Blends. H. E. Railsback, W. T. Cooper, and N. A. Stumpe, research and development department, Phillips Petroleum Co., Bartlesville, Okla.

Although polybutadienes of high (95%) *cis* configuration have displayed hysteresis properties fully equivalent to those of *Hevea*, the processing characteristics of these rubbers are inferior to those of the natural polymer.

It has been discovered that blending 95% *cis*-polybutadiene in 1:1 ratios with natural rubber gives compounds with good processing characteristics and excellent hysteresis properties. In addition, these blends exhibit 20 to 30%

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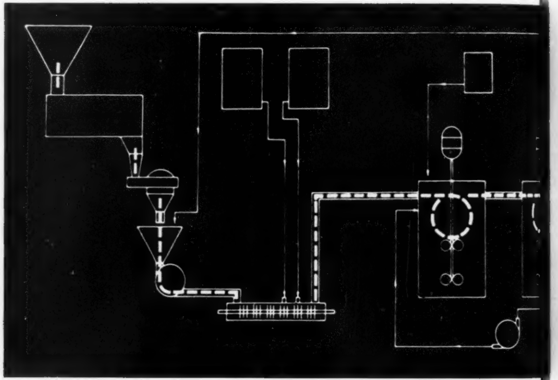

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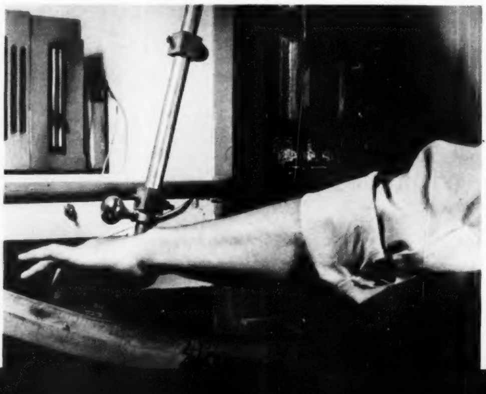

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better abrasion resistance in service (retread tires) than natural rubber alone. With these retread tires cracking resistance of the experimental stocks has been superior to that of the control.

A factory test comparing 1:1 *cis*-polybutadiene-natural rubber blends to nautral rubber has demonstrated that processing stocks of this type on large-scale equipment is practical. If the 10:00 x 20 truck tires on test confirm the results of the passenger retread tests, it should be possible to replace up to 50% or more of the natural rubber presently used in heavy-duty tire treads. In addition, a substantial improvement in the service performance should be realized compared to that obtained using natural rubber.

11:25 a.m.—33. The Development of a Synthetic Rubber for Self-Sealing Fuel Tanks for Aircraft. Lawrence Spenadel, Esso Research & Engineering; and Robert J. Good, Convair Scientific Research Laboratory, San Diego, Calif.

Swelling behavior and low-temperature properties have been measured for copolymers of butadiene-methylpentadiene. A strong dependence of swelling on the monomer ratios and sulfur content of the copolymers was found. The maximum swelling occurred when the copolymer contained 20-30% butadiene. The freezing temperature of the copolymer decreased with increasing butadiene percentage.

On the basis of the swelling behavior and low-temperature characteristics of various polymers, a 50/50 copolymer of butadiene-methylpentadiene was developed for use as a synthetic sealant for self-sealing fuel tanks. By using only 0.25% sulfur for the vulcanization it was possible to obtain a copolymer which was superior to natural rubber in its initial swelling and also had adequate low-temperature properties and mechanical strength.

SORG Spring Meeting

The spring technical meeting of The Southern Ohio Rubber Group was held April 3 in the Gibbons Hotel, Dayton, O. Approximately 80 members attended a smorgasbord dinner and techincal meeting on the subject of "Advertising—Science, Game or Hoax." This was a discussion of the various aspects of industrial advertising in general, and as related to the rubber industry in particular, intended to clarify the differences between good and bad advertising; problems of cooperation between engineering, laboratory, purchasing, and sales departments; and ways of reducing sales costs through effective advertising.

The subjects were covered by J. H. Hershey, director of public relations, Dayton Rubber Co.; W. Highmiller, president of H & H Art Studios, Dayton; and V. Koepnick, account executive, Geyer Advertising Co., Dayton. It was reported that a lively discussion ensued.

Philadelphia Group Hears Sigmann

The April 25 dinner-meeting of the Philadelphia Rubber Group, held at the Poor Richard Club, Philadelphia, Pa., was attended by 160 members and guests. A cocktail hour preceded the dinner.

R. A. Garrett, chairman, made the following announcements preceding the talk for the evening: Progress is being made on a 1958 Directory for the Philadelphia Rubber Group; Merrill Smith, of American Biltrite Rubber Co., was introduced as chairman of the publicity committee; and the golf outing will be held August 22. H. C. Remsberg, secretary-treasurer, reported that the membership of the group is 493.

John Sigmann, R. T. Vanderbilt Co., speaker for the evening, was introduced by Vice Chairman Ralph Graff. Mr. Sigmann's topic was "Planned Experiments in Rubber Compounding." A summary of the talk follows.

The first portion of the paper was devoted to a discussion comparing the concept of planned experiments to the more familiar classical method commonly employed in attempts to solve research and development problems. Each approach was outlined in detail so that the relative advantages and disadvantages of each could be compared directly. The classical, or Edisonian, type of research is very wasteful in time and effort in that by its construction only one variable is investigated at a time. As a contrast, planned experiments can be made more economical by considering two or more variables at one time.

An actual case history was described in the second portion of the paper to illustrate the basic procedures necessary to construct a planned experiment. Round-table discussions attended by all interested parties are a prerequisite for any well-planned experiment. Once all of the important variables have been established and practical limits have been set for each variable, a likely experimental model becomes self-evident. This phase is the most difficult one of the entire procedure.

The final section of the paper was devoted to the planning and use of more advanced designs, which included Latin squares and fractional replicates of factorial designs. The concept of interaction was introduced in connection with the liberties which the designer may or may not take in setting up such an experiment. The analysis of variance was briefly discussed as a tool for interpretation of experimental data.

Purchasing/Production

The Connecticut Rubber Group held a dinner-meeting at Manero's Restaurant, Orange, Conn., May 23, which was attended by 130 members and guests. The program included talks by E. S. Muller, Naugatuck Chemical Division, and W. A. Ware, Naugatuck footwear plant, United States Rubber Co., Naugatuck, Conn., on "Purchasing Procedures as Related to Production Problems." The treasurer's report and by-laws addendum constituted the business session of the meeting.

In their talks the guest speakers outlined the ways in which the purchasing agent or buyer helps the various other personnel of a company. The buyer has special qualifications as a person and has a real place in the industrial economy, it was said.

The buyer helps chemists and engineers by developing adequate specifications and by insisting that vendors conform. He assists in standardization and value analysis programs and keeps technical men informed on current outside developments. He gets vendors' technical help on various problems and deals with them on quality and other disputes.

The buyer helps production men by keeping them informed on arrival dates and delays and of any changes he makes from original requisitions. He expedites orders and interviews salesmen, passing on information received from them. He helps to establish adequate raw material specifications and develops alternative sources to assure continuity of production.

Also, the purchasing agent helps his own company's salesmen by supplying information on purchases from customers. He keeps them posted on market developments and availability forecasts which affect sales.

The buyer helps the salesmen who call on him by getting them an audience with the proper people. He explains the nature of the salesman's business and organization and helps him find the ground of common interest.

The buyer helps his own company's management in various ways, the speakers further declared. He negotiates the best price and terms for maximum profit. He helps management with make-or-buy decisions and keeps informed on matters that affect his company's policy decisions. He controls inventory investment for optimum management of his company's money and treats all visitors courteously to reflect credit to his employer.

The next technical meeting of the Connecticut Rubber Group will be held November 14, at the same place.

Eighth Canadian High Polymer Forum; Mechanisms, Properties Covered

The eighth Canadian High Polymer Forum was held May 12-14 at MacDonald College, Montreal, P.Q., Canada. Approximately 150 delegates who attended the three-day session listened to a paper by Professor G. Gee, University of Manchester, England, at the Forum banquet and to a total of 28 papers during the daytime sessions. The topics included such fields as biological phenomena, kinetics and mechanisms of polymerizations, preparation and properties of graft copolymers, anionic polymerizations, and the properties of solid polymers and of their solutions.

New Officers

At the business meeting of the Forum the election of officers resulted in the following slate of officers: chairman, M. H. Jones; program chairman, L. A. McLeod; secretary-treasurer, K. E. Russell. The location of the Ninth Forum has not been determined, but it is intended to be timed for the Fall of 1959.

Gee Paper

A highlight of the meeting was the paper presented to the Forum banquet by Professor Gee, entitled "Predicting Polymer Properties." Professor Gee reminisced to the early days of polymer chemistry when it was thought possible for a physicist to specify the properties he would desire in a polymeric product and for the chemist to define the molecular entities necessary to produce such properties. Experimental realization of this ideal has proved extremely difficult. Professor Gee discussed in brief outline some of the properties which one would like to predict and the efforts of his research team in attempting to accomplish this goal. He stressed two particular facets of his research work: work directed at a study of the force fields surrounding a polymer molecule and the forces of interaction between polymer molecules and the investigation concerning the flexibility of polymeric molecules.

Polymerization Mechanisms

The regular technical session heard papers devoted to studies related to kinetics and mechanisms of polymerization processes. B. L. Funt, University of Manitoba, reported the use of C^{14} tagged azobisisobutyronitrile as an initiator in a study of the termination reaction in vinyl polymerizations. Analyses of activity in the products were performed by a scintillator technique. The conclusions were that styrene is terminated by recombination; whereas polyvinyl acetate is terminated by disproportionation.

F. R. Eirich, of Polytechnic Institute of Brooklyn, reported the retardation of polymerization of vinyl acetate by aromatic vinyl compounds such as vinyl benzoate. The results are most easily explained by a transfer reaction with monomer; the magnitude of the effect depends on the electron donating power of the substituent.

P. B. Lumb, of Polymer Corp., Ltd., described the use of molecular weight measurements to discriminate between monomer transfer and spontaneous termination in the cationic polymerization of isobutylene. He concluded that polymerization of isobutylene with isoprene is terminated by a spontaneous loss of protons from growing carbonium ions.

Continuing a study of the rate of addition of methyl radicals to double bonds, M. Szwarc, of State University of New York, reported results of investigations using diene compounds. It was reported that isolated dienes behave essentially like two single olefin unsaturations; whereas conjugated dienes are much more reactive. Cumulative dienes are less reactive than the corresponding olefins. The methyl affinities of conjugated dienes are reduced markedly by the presence of methyl groups which are in the 1 and 4 positions.

In a closely related paper C. Sivertz, University of Western Ontario, reported measurements of the reactivities of double bonds by their reactivities with free radicals such as the thiyl radical. This radical adds reversibly to *cis* or *trans* butene to yield a composite free radical capable of free rotation about the carbon-carbon bond. Decomposition of this radical then can lead to either the *cis* or the *trans* product, and it was reported that the equilibrium concentration of *cis* and *trans* butene is obtained if the reaction time is sufficently large. Rate constants for the various reactions were deduced.

Graft Polymers

Graft polymers were discussed in two different papers. In the first, G. Ayrey, McMaster University, described attempts to graft methyl methacrylate on to natural rubber. It was observed that grafts could be successfully attached to this substrate, using benzoyl peroxide as initiator, but not using azobisisobutyronitrile. Analysis showed that 90% of the initiating radicals were of the benzoyloxy type when initiation was by addition to the isoprene double bond. Almost equally common, however, was initiation by abstraction of the α-methylenic hydrogen. By using scintillator techniques it was determined that termination is approximately 40% by combination and 60% by disproportionation.

E. H. Immergut, of the Dunlop Research Center, Canada, reported the grafting of vinyl monomers on to nylon, Dacron and rayon fibers by means of beta or gamma irradiation. Gamma irradiation was more efficient than beta irradiation, and grafting occurred more readily when irradiation was carried out in the presence of monomer. Paramagnetic resonance spectra indicated that the life times of radicals formed by irradiation could be as long as a month. Even at the highest radiation dose rate, however, calculations indicated as few as one graft per 28 fiber molecules.

Polyethylene, Polycarbonate Resins

W. L. Hawkins, Bell Telephone Laboratories, reported that conventional amine-type antioxidants show greatly reduced efficiency for the protection of polyethylene when carbon black has been added to the compounds. On the other hand, however, sulphur-containing compounds show an enhanced antioxidant effect in the presence of carbon black. This interaction is being studied in more detail, and attempts are being made to extend the studies to temperatures lower than the 140° C. used in this investigation.

K. B. Goldblum, General Electric Co., reported methods of preparation of polycarbonate resins. Polymerization details were described, and the products were reported to have enhanced tensile strength, heat stability, impact strength, and electrical properties.

New Polymerization Processes

One session of the conference was devoted to discussions of processes for producing new types of polymers, particularly those based on supported catalysts or anionic polymerizations. Professor Gee discussed results obtained in the polymerization of epoxides, using basic catalysts such as sodium methoxide. Points of attack of the catalyst on different starting materials were studied carefully, and it was shown that propylene oxide is initiated almost entirely to form a secondary alcohol. For ethylene oxide, initiation and propagation rates are very similar, but initiation of propylene oxide is more rapid than propagation. For isobutene oxide propagation rate is negligible.

In the polymerization of propylene oxide, using methyl alcohol as solvent, a simple transfer mechanism with solvent is not sufficient to explain the molecular weights observed. In this system the molecular weight distribution is not of the Poisson type, and this observation leads to postulation of an additional termination step which in-

troduces unsaturation into the product.

E. Field, of Standard Oil Co. of Indiana, reported on the use of supported metal oxide catalysts for the polymerization of ethylene with high density. Molybdenum was observed to be a particularly suitable catalyst, and catalysts could be promoted by the addition of hydrides and carbides.

The kinetics of anionic polymerization of styrene were discussed by K. F. O'Driscoll, of Princeton University. Styrene initiated by butyl lithium was polymerized in benzene solution and in tetrahydrofuran. In benzene the propagation rate is independent of the catalyst concentration, but in THF a complex dependence of propagation rate was determined, based on unassociated butyl lithium concentration. The structure of isoprene polymerized in benzene was changed very markedly by the addition of a small quantity of THF.

G. A. Olah, of Dow Chemical of Canada, Ltd., has succeeded in isolating carbonium tetrafluoroborates which have been postulated as the intermediate in Friedel-Crafts polymerization and alkylation reactions. The composition and structure of the isolated materials have been confirmed by synthesis.

M. A. Golub, of B. F. Goodrich Research Center, reported on the induced isomerization of butadiene under the influence of gamma rays and in the presence of a disulfide or mercaptan sensitizer. From a kinetic analysis of the results an activation energy of two Kcals was determined for the isomerization.

Physical Properties

The program was concluded by a series of papers relating to the physical properties of polymers and of polymer solutions. Crystallization rates were discussed by G. S. Trick, of Goodyear Tire & Rubber Co. The rate of crystallization of natural rubber is considerably slower than that of balata, *cis* polybutadiene, polyethylene oxide, or polyethylene, and although *cis* polybutadiene crystallized very rapidly at 0° C. even when vulcanized, its rate of crystallization could be retarded considerably by the addition of materials such as thiobenzoic acid. Synthetic *cis* polyisoprene, on the other hand, was slow to crystallize, and its rate of crystallization could be increased to that of natural rubber by the addition of suitable crystallization accelerators.

Another form of interaction of polymers occurs in the coagulation of latices, and the effect of partial coagulation on the particle size distribution was discussed by E. L. Rowe, of Wayne State University. A study of the particle size distribution of partially coagulated latex showed that coagulation had been largely at the expense of the smaller particles.

Rubber Division, CIC, Toronto Meeting

The Division of Rubber Chemistry, in conjunction with the forty-first annual conference of the parent society, the Chemical Institute of Canada, held a full day's conference on May 28 at the Royal York Hotel, Toronto, Ont., Canada. Wray A. Cline, of Canadian General-Tower, Ltd., and chairman of the Ontario Rubber Group, presided at the morning session, which consisted of the presentation of the following technical papers (abstracts of papers presented appeared in RUBBER WORLD, May, 1958, pages 275-76):

"Factors Influencing Cut Growth Testing," by W. A. Gurney and I. C. Cheetham, Dunlop Research Center, Birmingham, England; "Studies of Synthetic Polymers with the Electron Microscope," by W. Rupar and L. Breitman, Polymer Corp., Ltd., Sarnia, Ont.; "Effects of Radiation on Raw and Vulcanized Elastomers," by T. C. Gregson, W. R. Miller, L. B. Bangs, and S. D. Gehman, Goodyear Tire & Rubber Co., Akron, O.; "Some Studies on the Dispersion of Carbon Black in Rubber," C. W. Sweitzer, W. M. Hess, and J. E. Callan, Columbian Carbon Co., New York, N. Y.; and "Recent Advances in Rayon Tire Yarn," A. Sandig, Courtaulds (Canada), Ltd., Cornwall, Ont.

Preceded by a short cocktail party, provided through the courtesy of the suppliers, the Rubber Division luncheon was well attended by more than 150 members and guests. H. K. Cunliffe, Dunlop Canada, Ltd., chairman of the Division of Rubber Chemistry, CIC, introduced the guests at the head table as follows:

Carl M. Croakman, Columbian Carbon Canada, Ltd., Alex Jaychuk, Goodyear, O. R. Huggenberger, Dominion Rubber Co., Ltd., J. A. Carr, Dunlop Research Center, all Rubber Division executives; O. J. Walker, past president, CIC; W. G. Aird, Reichold Chemicals, chairman, CIC Conference; C. E. Carson, Imperial Oil, president-elect, CIC; Leroy T. Rosser, president, Mansfield Rubber (Canada), Ltd., guest speaker; T. H. G. Michael, general manager, CIC; W. Jonah, Louis Specialties, Ltd., session chairman; Mr. Cline; Dr. Piche, Universite de Montreal, CIC executive; J. L. MacDonald, Rubber Division executive. Also among the prominent guests present were two past chairmen of the CIC, Paul E. Gagnon, guest speaker at the May 26 luncheon; and this year's Montreal Medallist, T. W. Smith. Mr. Rosser, guest speaker at the Rubber Division luncheon, was also introduced by Mr. Cunliffe.

In his address, Mr. Rosser illustrated his talk, "Economics of the Canadian Rubber Industry," with a personal story of the many difficulties that had to be overcome in establishing a new tire company in Canada. From this he led into the main theme of his address, which he entitled "Viewpoint" and which dealt with the advantages of always considering the other person's point of view; of considering both sides of every question, honestly and fairly. To accept and not discard through prejudice new ideas and other peoples' opinions is a necessary consideration, he stated. If this were given a thorough trial, it would surely reduce present frustrations and tensions at the diplomatic level between countries, in modern business dealings between corporations and within those same corporations, even in our home life and each individual life.

J. A. Carr expressed the sincere thanks of all present to Mr. Rosser for his address, and the luncheon was adjourned until the afternoon technical session. With W. Jonah, 1958 chairman of the Quebec Rubber & Plastics Group, in the chair, the afternoon technical session consisted of the presentation of the following papers:

"Factors Affecting the Physical Properties of Furnace Black/Butyl Rubber Vulcanizates," by D. F. Walker, E. M. Dannenberg, and B. B. S. T. Boonstra, Godfrey L. Cabot, Inc., Cambridge, Mass.; "Lignin-Rubber Technology," by D. W. MacGregor, L. H. Krichew, and T. R. Griffith, National Research Council, Ottawa, Ont.; "Maleic Anhydride Modified Elastomers," H. W. Paxton, R. H. Snyder, P. F. Gunberg, and P. O. Tawney, United States Rubber Co., Wayne, N. J.; and "The Pneumatic Tire—Yesterday, Today, and Tomorrow," by J. E. Corey, Firestone Tire & Rubber Co., Akron.

At the conclusion of all technical sessions, most of the guests and members, with their ladies, attended the President's Reception which preceded the annual dinner in the ballroom of the Royal York Hotel.

Included in the highlights of the Conference was a plant visit to the new Dunlop Canada, Ltd., tire and foam plants at Whitby, Ont., on the first afternoon of the Conference.

Groups Enjoy Outings

Fort Wayne Plays Golf

The Fort Wayne Rubber & Plastics Group held its seventh annual summer golf outing at Tippecanoe Country Club, Leesburg, Ind., on June 6. A smorgasbord of shrimp and beef was served to the 268 members and guests in attendance. Golf and door prizes were donated by 111 contributors, which were greatly appreciated. The golf prizes were awarded to the following:

One putter eighth green, Morris

Keyser, Rohm & Haas; first low gross, Dan Lamb, Firestone Industrial Products (also winner of Goshen Rubber Trophy); second low gross, Dan Rieger, Bakelite Co.; first closest to pin, John Ahler, J. M. Huber Corp.; second closest to pin, Wayne Place, Jasper Rubber Products; first long drive, Mr. Keyser; second long drive, T. Reuterdahl, a guest; first, least number of putts, J. J. McCarthy, United States Rubber Co.; high gross, J. Fehring, a guest; first low net trophy and prize, A. L. Robinson, Harwick Standard Chemical Co.; second low net, Al Hatfield, B. F. Goodrich Co.; third low net, F. Thompson, Marbon Chemical Division, Borg Warner Corp.

The outing committee consisted of Mr. Robinson, chairman; John Lawless, E. I. du Pont de Nemours & Co., Inc.; Jack Lippincott and Ed Theall, both of Dryden Rubber Division, Sheller Mfg. Corp.; John Porter, H. Muehlstein & Co., Inc.; M. J. O'Connor, O'Connor & Co.; Howard Cantwell, U. S. Rubber; Stan Shaw, Witco Chemical Co.; and Walton D. Wilson, R. T. Vanderbilt Co.

The new officers of the Group for 1958-1959 to take over are: Philip Magner, Jr., chairman, General Tire & Rubber Co.; Mr. Wilson, vice chairman; and Al Bluestein, Anaconda Wire & Cable Co., secretary-treasurer.

The next meeting of the Group will be held at the Van Orman Hotel, Fort Wayne, Ind., on September 25.

Record Crowd for Boston Group

The twenty-second and largest outing ever held by the Boston Rubber Group occurred June 20, at the Andover Country Club, Andover, Mass., with 735 members and guests participating in the golf tournament and enjoying a big, family-style dinner under a big tent, featuring boiled lobsters. The newly renovated and enlarged clubhouse provided ideal surroundings.

The outing committee consisted of executive committee member George Herbert, Tyer Rubber Co., chairman; Harry Atwater, permanent historian; John M. Hussey, Goodyear Tire & Rubber Co.; and the following activities chairmen: golf tournament—Lyle Longworth, Monsanto Chemical Co.; softball games—E. F. Freeman, Stedfast Rubber Co.; putting contest—J. H. Fitzgerald, Harwick Standard Chemical Co.; darts—N. Herthel, B. F. Goodrich Footwear & Flooring Division; horseshoes—Philip Blanchard, P. Blanchard Co.; horse racing—Carl Meyer, Harwick Standard; and tub and ball game—H. Anthony, Tyer Rubber.

Everyone present received a door prize, thanks to the generosity of 228 suppliers and friends, to whom the golfers and other game winners were also indebted for their prizes. The record turnout came in face of an overcast, cold day, but the rain held off until after the dinner, making the event a pleasant one for all.

The winners in the various activities were announced as follows: baseball—two games were played, the winner of the first, Boston Woven Hose & Rubber Co., lost the second game to Avon Sole Co., and helpers. The winning team included: Chester Smith (captain), H. Hathaway, John DuPont, all of Avon Sole, Robert Miller, RUBBER WORLD, J. Lorray, Charles Ayres, R. Paglucci, Richard Flecker, and Robert Hale.

Low gross for the nine-hole golf tournament was scored by A. Macalaster, Macalaster-Bicknell Co. Low net was won by J. Graham, Hercules Powder Co.; high gross, J. E. Zayne, Deecy Products Co.; high net, F. R. Peterson, General Tire; and first in kickers handicap, Philip Rolbin, Goodrich Footwear & Flooring.

Low gross in the 18-hole tournament was a tie between A. Nelson, Goodrich, and J. Beale, Schenectady Varnish Co. By lot, Nelson was selected to receive the Soctex trophy, a medium-size sterling reproduction of the Revere Bowl. Low gross winner was J. Garcia, Interstate Mfg. Co.; low net, D. Knight, Godfrey L. Cabot, Inc.; and kickers handicap, James Haggerty, A. C. Nispel Co., and G. Kanchuga, a guest.

First place in the putting contest went to E. H. Kittredge, Interchemical Corp.; first place in darts, H. Doyle, Summit Chemical Co.; tub and ball winner, Nils Sandner, Stowe-Woodward Co.; and top horseshoe team, Robert Killam and Joseph Colell, both of Avon Sole.

The next meeting of the Boston Rubber Group will be on October 17, at the Hotel Somerset, Boston, Mass., at which time a technical meeting will be held. Subject, speakers, and chairman will be announced at a later date.

R. I. Club Golf Outing

Approximately 310 members and guests attended the Rhode Island Rubber Club summer outing and golf tournament held at the Pawtucket Country Club, Pawtucket, R. I., June 5. At a roast-beef dinner following the tournament, the following golf winners were awarded prizes:

First low gross, C. Lyons, Rubber Corp. of America; second low gross, Wm. A. Maguire, United Carbon Co.; third low gross T. Jordan, Firestone Rubber & Latex Products Co.; and blind bogey winners, C. Damicone, Acushnet Process Co., S. Shorey, Monsanto Chemical Co., and C. C. Hronek, Kaiser Aluminum Co.

Nearest to pin winners were P. Uva, Avon Rubber Co., J. O'Grady, guest, and R. B. Robitaille, Phillips Chemical Co. Most sixes was won by D. Lukens, Lukens Chemical Co.; most sevens, J. Frankfueth, guest; and most eights, P. Buton, Globe Mfg. Co. The high net award went to W. Y. Bromstedt, Firestone Rubber & Latex Co., and the longest drive was hit by B. Adson, Goodrich-Gulf Chemical Co.

New York's Diversified Program

The New York Rubber Group held its annual summer outing at Doerr's Grove, Millburn, N. J., June 5, with some 210 members and guests in attendance. A variety of sports activities continued throughout the day, concluding with a roast beef dinner.

W. H. Crom, Merck & Co., Inc., took top honors in the golf contest. M. Malkiewicz, Manhattan Rubber Division, came out first in the baseball throw; while Richard Burd led the field in the basketball throw. A team captained by Larry Eby, Enjay Co., won the day's major softball game.

B. McMartin and G. Walker, both of Du Pont, made up the afternoon's best bocci team. First place in the horseshoe contest went to W. Lamela, Okonite Wire & Cable Co. Other contests included dart throwing, fly-casting, and hit-the-bottle. The co-chairmen of the outing were F. Raba, Triangle Conduit & Cable Co., and M. R. Buffington, Lea Fabrics, Inc. The various contests were coordinated by C. V. Lundberg, Bell Telephone Laboratories.

C. Jansen and M. Lerner, both of *Rubber Age*, handled the ticket arrangements, and the latter also distributed the door prizes which included a portable TV set and six transistor radios.

August 5 is the date of this year's golf outing to be held at Wingfoot Country Club, Mamaroneck, N. Y. More details will be mailed out preceding the tournament.

Buffalo Holds Golf Tourney

The Buffalo Rubber Group held its annual golf outing at the Lancaster Country Club, Buffalo, N. Y., on June 10. Attending the outing and dinner were 120 members and guests. Robert Sucker, Witco Chemical Co., had a low score of 74, two over par, and was awarded a plaque.

Chicago Prizes TV Sets

At the Chicago Rubber Group golf outing to be held July 25 four portable television sets will be awarded. In addition, door prizes and golf prizes will be awarded to all attending the meeting.

The committee chairman, E. Wagner, Witco Chemical Co., has reported that all indications are that the outing will be the largest in the history of the group. It is expected that prizes in excess of a retail value of $4,000 will be awarded.

The outing will be held at Medinah Country Club, Medinah, Ill., starting at 8:00 a.m., July 25.

Mark on Stereospecific Polymers, at Thiokol Club

Herman F. Mark, director of the Polymer Research Institute and professor of chemistry at the Polytechnic Institute of Brooklyn, was the speaker at the June 12 meeting of the Thiokol Technical Club, held at the Thiokol Chemical Corp., laboratories, Trenton, N. J.

Speaking on "Progress in Stereospecific Polymers," Dr. Mark opened his talk with a review of free radical, anionic, and cationic polymerizations. For some time now polymer chemists have known how to initiate the various-type polymerizations, speedup or slowdown their rate of propagation, and modify them to obtain various molecular weight distributions. It has only been quite recently, the speaker said, that polymer chemists have been able to control the regularity of the polymerization propagation process.

The new stereospecific polymers are made possible by new initiators of polymerization such as lithium alkyls and the presence or absence of a stereoregulator such as diethyl ether. Some of the new stereospecific polymers are, according to Dr. Mark, polyisoprene, vinyl fluoroacetate, and polymethyl methacrylate. From the last two polymers, a great variety of stereospecific polymers may be made, Dr. Mark declared.

The technical meeting was opened by Edward Fettes, Thiokol's director of research and development, who introduced J. C. Patrick, discoverer of the original Thiokol polysulfide rubber, who has been nominated to receive the ACS Rubber Division's Goodyear Medal. Dr. Patrick was formerly director of research for Thiokol and now, although retired, acts as a consultant to the company.

The technical meeting was preceded by a cocktail hour and buffet supper.

CALENDAR of COMING EVENTS

July 25
Chicago Rubber Group. Golf Outing. Medinah Country Club, Medinah, Ill.

August 5
New York Rubber Group. Golf Tournament. Wingfoot Country Club, Mamaroneck, N. Y.

August 22
Philadelphia Rubber Group. Golf Outing. Manufacturers Golf & Country Club, Oreland, Pa.

September 3-5
First National Conference on the Application of Electrical Insulation. Cleveland, O.

September 6
Connecticut Rubber Group. Outing.

September 7-12
American Chemical Society. Chicago, Ill.

September 9-12
Division of Rubber Chemistry, ACS. Hotel Sherman, Chicago, Ill.

September 11
Northern California Rubber Group.

September 25
Fort Wayne Rubber & Plastics Group. Van Orman Hotel, Fort Wayne, Ind.

October 3
Detroit Rubber & Plastics Group, Inc. Detroit-Leland Hotel, Detroit, Mich.
Chicago Rubber Group.

October 7
The Los Angeles Rubber Group, Inc. Biltmore Hotel, Los Angeles, Calif.

October 9
Northern California Rubber Group.
Southern Ohio Rubber Group.

October 14
Buffalo Rubber Group. Hotel Westbrook, Buffalo, N. Y.

October 17
New York Rubber Group. Henry Hudson Hotel, New York, N. Y.
Boston Rubber Group. Hotel Somerset, Boston, Mass.

October 17-18
Southern Rubber Group. Roosevelt Hotel, New Orleans, La.

October 21
Elastomer & Plastics Group, Northeastern Section, ACS. Annual Meeting. Science Park, Charles River Dam, Boston, Mass.

October 24
Philadelphia Rubber Group. Poor Richard Club, Philadelphia, Pa.
Akron Rubber Group.

October 28
Assn. of Consulting Chemists & Chemical Engineers, Inc. Thirtieth Annual Meeting: Symposium, "What's New in Chemistry." Biltmore Hotel, New York, N. Y.

November 4
The Los Angeles Rubber Group, Inc. Biltmore Hotel, Los Angeles, Calif.

November 6
Rhode Island Rubber Club.

November 13
Northern California Rubber Group.

November 14
Philadelphia Rubber Group. Dance. Manufacturer's Golf & Country Club, Oreland, Pa.
Connecticut Rubber Group. Manero's Restaurant, Orange, Conn.
Chicago Rubber Group.

November 17-21
Eighth National Plastics Exposition. Society of the Plastics Industry. International Amphitheatre, Chicago, Ill.
National Plastics Conference. Hotel Morrison, Chicago.

December 2
Buffalo Rubber Group. Party.

December 4
Fort Wayne Rubber & Plastics Group. Van Orman Hotel, Fort Wayne, Ind.

December 5
Detroit Rubber & Plastics Group, Inc. Christmas Party. Sheraton-Cadillac Hotel, Detroit, Mich.

December 12
New York Rubber Group. Christmas Party. Henry Hudson Hotel, New York, N. Y.
Boston Rubber Group. Christmas Party. Hotel Somerset, Boston, Mass.

December 13
Southern Ohio Rubber Group.

December 19
Chicago Rubber Group.

1959

January 23
Philadelphia Rubber Group. Poor Richard Club, Philadelphia, Pa.

January 30-31
Southern Rubber Group. Statler Hotel, Dallas, Tex.

February 3
The Los Angeles Rubber Group, Inc. Biltmore Hotel, Los Angeles, Calif.

February 6-8
Boston Rubber Group. Annual Ski Week-End. White Mountains, N. H.

February 12
Fort Wayne Rubber & Plastics Group. Van Orman Hotel, Fort Wayne, Ind.

March 3
The Los Angeles Rubber Group, Inc. Biltmore Hotel, Los Angeles, Calif.

April 7
The Los Angeles Rubber Group, Inc. Biltmore Hotel, Los Angeles, Calif.

WASHINGTON REPORT

By JOHN F. KING

ODM Reports Stockpile Policy Changes; Results About Maintain Status Quo

The Office of Defense Mobilization's long-drawn-out review of the reasons why the United States needs a stockpile of key industrial materials limped to a conclusion in June. The sum total of the 14 policy changes ordered by Defense Mobilizer Gordon Gray on June 12 is that the stockpile situation is about *status quo*.

No Rubber Stockpile Change

In terms of the 1.2 million tons of natural rubber stored away in government warehouses against a mobilization emergency, the "new" policies mean that there will be no change—no disposals and no liquidations—for the foreseeable future. The key revision affecting the rubber hoard ordered by ODM in past policy, effective June 30, is Order 13, which says:

"Strategic and critical materials shall be retained in government inventories so long as they are needed to meet maximum stockpile objectives (to meet shortages for a three-year emergency period) or any foreseeable increases in such objectives."

This would seem to say that while the 1.2 million tons of rubber available is excessive because it represents the total amount needed to feed the industry during a five-year instead of a three-year emergency, strategic concepts may change in the future requiring the government to frame again its estimates in terms of a five-year mobilization period.

Additional evidence that ODM plans no rubber disposal operations is the fact that none of the 14 new policy revisions even hinted at asking Congress for legislation to permit such an undertaking. Under the Stockpiling Act, Congress would specifically have to approve any liquidation of the $7-billion defense stock. With respect to sensitive economic and political questions involved in rubber prices, which would undoubtedly be severely affected by any move toward liquidation, Order 13 adds this sentence:

"Disposals of excesses shall be undertaken only if they do not cause serious economic disruption or adversely affect the international interests of the U.S."

This appeared to be the same as saying that if stock liquidations threatened to depress the price of a basic commodity like rubber during a period of economic slowdown, which is what would happen should the stockpile be tinkered with, then no such action is contemplated. Moreover, should a move toward rubber disposal threaten to shake the economy of politically sensitive southeast Asia, which it would, then the same considerations would apply—no stockpile tinkering.

1958 vs. 1957 Thinking

This interpretation of the so-called "new" policy of ODM contrasts sharply with the dire predictions heard last fall that the government was determined to pare down the stockpile's 75-odd commodity inventories in the belief that they were too large and constituted a threat to the free commodity markets. The simple rationale for this effort was that the United States, which since the Cold War began had built up its stockpile in anticipation of a five-year emergency, had decided that any future conflict, local or general, would be settled within three years.

This change-up in strategic thinking came in mid-1957. The Russian Sputniks with their clear message that the Soviet Union was at least abreast of the United States in science and technology merely gave impetus to this doctrine. But in the interval the "underdeveloped-country crisis" has developed. This crisis made clear to Washington that there was more to the Cold War than matching and surpassing the Russians in rocketry. Flareups in the Middle East and Africa, southeast Asia, and then this spring in Latin America with the anti-American riots touched off by the visit to the area of Vice President Nixon, have created a new atmosphere in government circles. Briefly stated, it is the realization that the United States has not only a right to lead the Free World, but commensurate responsibilities to the members of the free community of nations.

So it appears that the widely expected shaking out of the stockpile, whether it involves non-ferrous metals, minerals, or rubber, will be deferred for some time. There is no doubt the government would like to carry forward its 1957 liquidation plans. Mobilization officials have made it clear for some time that they think a substantial disposal operation would be "healthy" for both the government and industry as well. But the shaky world price structure for most basic industrial raw materials, in no small part due to the current economic recession in this country, will not permit of market tinkering, at this time anyhow.

Washington's current mood in some measure accounts for the fact that ODM's June 12 Orders on "General Policies for the Stockpile of Strategic and Critical Materials" were restricted to the broadest generalities.

They altogether ignored, for example, the recommendations of its Special Stockpile Advisory Committee, headed by Holman D. Pettibone, that commodities such as rubber in excess of mobilization requirements should be disposed of. They did incorporate the Pettibone Committee's recommendation that all stockpiling should be based upon anticipation of a three-year emergency, but mobilization officials admit ODM had been operating on this basis since last summer, six months before the 12-man committee of business experts was even called on.

Other Details

Apart from the aforementioned crucial questions of stockpile policy, the ODM Order (V-7) specified:

(1) Materials now on hand which do not meet specifications may be processed to stockpile standards "when this can be accomplished at less cost to the government than the purchase of new specification-grade materials."

(2) In order to meet the initial impact of intensive mobilization, materials may be processed in some cases to readily usable forms in amounts generally equivalent to a six-month requirement, unless an inter-agency review indicates the need of a larger or smaller amount.

(3) Close observation will be maintained for the use of materials having high-temperature or other special properties to insure that shortages do not develop as a result of rapidly changing technology.

(4) Stockpile information will be declassified by ODM when it determines "with the concurrence of agencies concerned" that disclosure will not jeopardize the national security.

IRSG Estimates 1958 Rubber Consumption; Commends Replanting, New Rubber Progress

The fourteenth meeting of the International Study Group was held in Hamburg, Germany, June 9-14. The chairman for this meeting was Albert Shafer, the delegate of the Federal Republic of Germany, and the vice chairmen were P. F. Adams, delegate of the Federation of Malaya, and Willis A. Armstrong, delegate from the United States of America.

Representatives Present

The meeting was attended by delegations from Australia, Austria, Belgium, Canada, Ceylon, Czechoslovakia, Denmark, France, Federal Republic of Germany, Hungary, Indonesia, Italy, Japan, Liberia, Federation of Malaya, Netherlands, Thailand, United Kingdom, United States of America, and Viet-Nam. Observers were present from the Food & Agricultural Organization, the Organization for Economic Cooperation, the International Rubber Development Committee, and the International Bank for Reconstruction & Development.

Nine representatives of the rubber goods manufacturing industry and five representatives of the Rubber Trade Association of New York were present at this meeting as advisors to the U. S. delegate, Mr. Armstrong, of the State Department. These advisors were as follows: Harvey S. Firestone, Jr., and J. C. Roberts, of Firestone Tire & Rubber Co.; William O'Neil and M. G. O'Neil, General Tire & Rubber Co.; J. Ward Keener and Karl O. Nygaard, B. F. Goodrich Co.; Robert S. Wilson, Goodyear Tire & Rubber Co.; H. E. Humphreys, Jr., United States Rubber Co.; and Ross R. Ormsby, Rubber Manufacturers Association, Inc. Representing the RTA of N. Y. were James D. Paterson, H. A. Astlett Co.; Robert A. Badenhop, Robert Badenhop Corp.; Joseph Louis, Littlejohn & Co.; Fred Koyle, Carl M. Loeb, Rhoades & Co.; and R. D. Young, of the RTA of N. Y.

Rubber Statistics

The Study Group examined the statistical position of rubber and made estimates for natural and synthetic rubber requirements and supply during 1958, which are detailed in Tables 1 and 2. World new rubber consumption was estimated at 1,915,000 long tons of natural and 1,237,000 long tons of synthetic rubber, apart from the synthetic rubber produced in nonmember countries. World natural rubber production is expected to amount to 1,920,000 long tons this year, somewhat in excess of consumption for the first time in several years. Production capacity for synthetic rubber in member countries is now sufficient to meet all requirements, it was said.

Replanting, New Rubbers, Etc.

Reports on the excellent progress made in replanting natural rubber producing areas with high-yielding material and the use of other measures to increase the production efficiency of the industry were received with interest. It was also indicated that some producing countries have substantially increased the funds available for research and development.

The Group took note of the work on the improvement in the grading of natural rubber and of the continued progress made in the improvement and development of new types of natural rubber. Consumer interest in specialized rubbers was noted also, but it is considered that at this stage the initiative for promoting these rubbers rests with the producers who should make their own arrangements with consumers and traders to provide supplies through normal market channels. The use of specialized rubbers would be greatly facilitated if producers could make samples of these materials and technical information about them available on an adequate scale, it was stated.

The Group expressed its appreciation of the work done by the joint RMA-RTA of N. Y. type sample committee in the preparation and issue of international type samples and noted with satisfaction that the preparation and issue of these type samples were expected to be completed by the end of 1958.

The IRSG decided to call to the attention of the Customs Cooperation Council in Brussels the importance which the Group attaches to the expansion of trade in rubber, both natural and synthetic, and the interest of the Group in possible customs definitions which might affect this trade, particularly with reference to the progressive development in the range and application of modified forms of both materials.

Price Stabilization, Stockpiles

It was reported that the Group considered a number of alternative suggestions from governments for reducing fluctuations in the price of natural rubber. While it was agreed that greater stability in price was desirable, views differed regarding the desirability or practicability of achieving this by means of an international stabilization scheme. Certain specific proposals were made with the objective of achieving greater stability in prices, and these proposals will be studied further by member countries. In view of the possibility that circumstances might change so as to alter the balance of considerations for and against international measures, the management committee of the Group was instructed to keep the matter under review.

The IRSG took note of a statement of the delegate of the U.S.A. that this government had announced on June 13, in regard to the U.S.A. strategic stockpile, that present disposal policies remain unchanged, and that materials in the U.S.A. stockpile in excess of objectives are not to be disposed of if disposal would disrupt the market.

The Group accepted the invitation of the Federation of Malaya to hold its next meeting in Kuala Lumpur, and it was decided that the meeting should be held some time in the first half of 1960 or at a date to be determined later. The management committee was authorized however, to call an earlier meeting of the Group at any time should the circumstances require. There has been growing criticism of the frequency of the Study Group meetings in view of the personnel involved and the accomplishments of these meetings.

TABLE 1. ESTIMATED NATURAL AND SYNTHETIC RUBBER REQUIREMENTS IN 1958

(IN 1,000 LONG TONS)

Territory	Natural	Synthetic	Total
U.S.A.	482	853	1,335
U. K.	182	70	252
France	134	63	197
Federal Republic of Germany	126	63	189
Japan	130	17	147
Canada	38	49	87
Italy	54	22	76
Australia	35	16	51
Czechoslovakia	50	(†)	50
Belgium	21	4	25
Netherlands	18	6	24
Austria	13	3	16
Hungary	10	(†)	10
Denmark	7	1	8
Other countries	615	70	685
	1,915	1,237	3,152

(†) Consumption data for synthetic rubber exclude synthetic rubber produced in non-member countries.
The oil-content of oil-extended synthetic rubber is included in the figures.

TABLE 2. ESTIMATED NATURAL RUBBER PRODUCTION IN 1958

(IN 1,000 LONG TONS)

Territory	
Indonesia	680
Malaya	654
Thailand	133
Ceylon	90
Viet-Nam	69
British Africa	48
Sarawak	40
Liberia	39
Belgian Congo	37
Cambodia	32
Other British Borneo	21
Burma	12
Papua	4
French Africa	4
Other countries	57
	1,920

FTC Tire Advertising Guides Start August 27

Effective August 27, some months after the boom season for tire sales has begun, the new and long-awaited Federal Trade Commission regulations on tire advertising, which are entirely voluntary, finally come into force.

Voluntary Compliance?

The 12 guides promulgated by FTC in late May are aimed, according to the agency, at "ending the public confusion over the meaning of high sounding advertising terms for automobile and truck tires." In brief, the guides call for tire manufacturers and dealers so to advertise and label tires that a buyer will not be misled as to the quality and safety of any brand he purchases. Although FTC touts the guides as "entirely voluntary" and a "new type of law enforcement," a violation of the new rules can lead to formal FTC complaints and prosecution under the Federal Trade Commission Act.

Under the informal rules the agency's Bureau of Consultation will work with members of the tire industry to achieve voluntary compliance, a May 28 announcement said. It cautioned, however, that FTC's investigation and litigation staffs will continue "to be diligent in using mandatory procedures whenever necessary" when it appears federal laws against false advertising have been violated.

The "innovation" of voluntary compliance with advertising "guidelines" was described by FTC Chairman John W. Gwynne as an attempt to "pinpoint a particular area of confusion concerning an industry's product, and to set forth for the guidance of all concerned what the Commission believes the law requires for the protection of competition and the public interest." Mr. Gwynne noted that earlier FTC attempts to get industry-wide voluntary compliance with law have been limited to trade practice conferences, covering all aspects of an industry's practices that fall under FTC jurisdiction, and to staff guides by which FTC instructed its own officers on requirements of "proper advertising."

The 12 Ad Guides

Following is a summary of the final guides, issued after a long-drawn-out series of conferences with industry officials that began last year:

1. Standards of Construction. No tire advertising or labeling should be used which implies that a tire conforms to a quality standard when no such standard exists. If a seller says a tire conforms to his own, or some private standard, he must clearly identify whose standard it is. In any event, a tire advertised as "first line" must be the particular manufacturer's (or brand-name distributor's) best tires, exclusive of his premium-quality products embodying special features.

Terms such as "100 level" and "120 level" must be accompanied by a clear and truthful explanation of what the seller means by them.

2. Deceptive Designations. Advertising and labeling should not use grade designations for tires that would lead buyers to believe they are getting a better grade of the manufacturer's tires than is the fact. For example, if a manufacturer's "first line" is designated as "standard" his "second line" tire must not be designated "super standard."

3. Original Equipment. This designation may be given only to tires generally used as original equipment on American-made current new-model cars. A tire formerly, but not currently used as "original equipment" must, if described as "original equipment," clearly disclose the latest actual year it was so used.

4. Plies. Tires must not be described as having more than their actual number of plies. (A ply is a layer of rubberized fabric contained in the body of a tire and extending from one bead of the tire to the other bead). The guide notes that the term "ply rating," as used in the trade, is an index of tire strength and does not necessarily represent the number of cord plies in the tire. Advertising which uses "6 ply rating" or "8 ply rating" to describe passenger-car tires must not only be truthful in describing the strength of the tires, but also must disclose any lesser number of plies.

Advertising also should contain an adequate disclosure (where necessary to prevent deception) of the identity of the ply fabric, such as cotton, rayon, nylon, etc., and also whether such tires require tubes.

5. Used Products. There must be a clear disclosure when tires offered for sale have been used. Unexplained terms, such as "New Tread" or "Snow Tread" to describe used tires are not adequate to disclose when such tires are not new.

6. "Change-overs." "New Car Take Offs." Such terms may be used only to describe tires that have been given insignificant use in delivering a new vehicle to its purchaser. They may not, however, be described as new tires. Advertising must state conspicuously that they have been used.

7. Disclosure that Products are Obsolete or Discontinued Models. When this is true, advertisements must conspicuously disclose the fact.

8. Prices. Advertised prices of products should be the bona fide actual selling price. When taxes, exclusive of local sales taxes, are not included in the advertised price, that fact should be made plain in the ad. Unqualified reference to a "list price" must refer to the advertiser's bona fide regular established current selling price. If it is not the seller's own list price, the advertisement must disclose whose it is. Furthermore, manufacturers and other distributors should not publish or distribute as "manufacturer's list prices" or "suggested list prices," etc., any price lists showing prices higher than those at which the tires regularly sell in trading areas where the price lists are published or distributed.

This guide also prohibits improper pricing practices that would apply to tires as well as all other commodities.

9. Guarantees. In addition to requiring conspicuous disclosure of the kind and extent of guarantees, advertising of products must make clear any limitations on the guarantees. For example, ads must disclose clearly whenever a guarantee provides only for an allowance on a new tire equal to the unused time or mileage on the guaranteed tire. Also, ads for "lifetime guaranteed" tires must contain a clear definition of what is meant by "lifetime."

This guide calls special attention to a prohibition against making guarantee adjustments based on fictitious list prices, adding that an adjustment based on any other price than that which purchasers pay must be disclosed clearly.

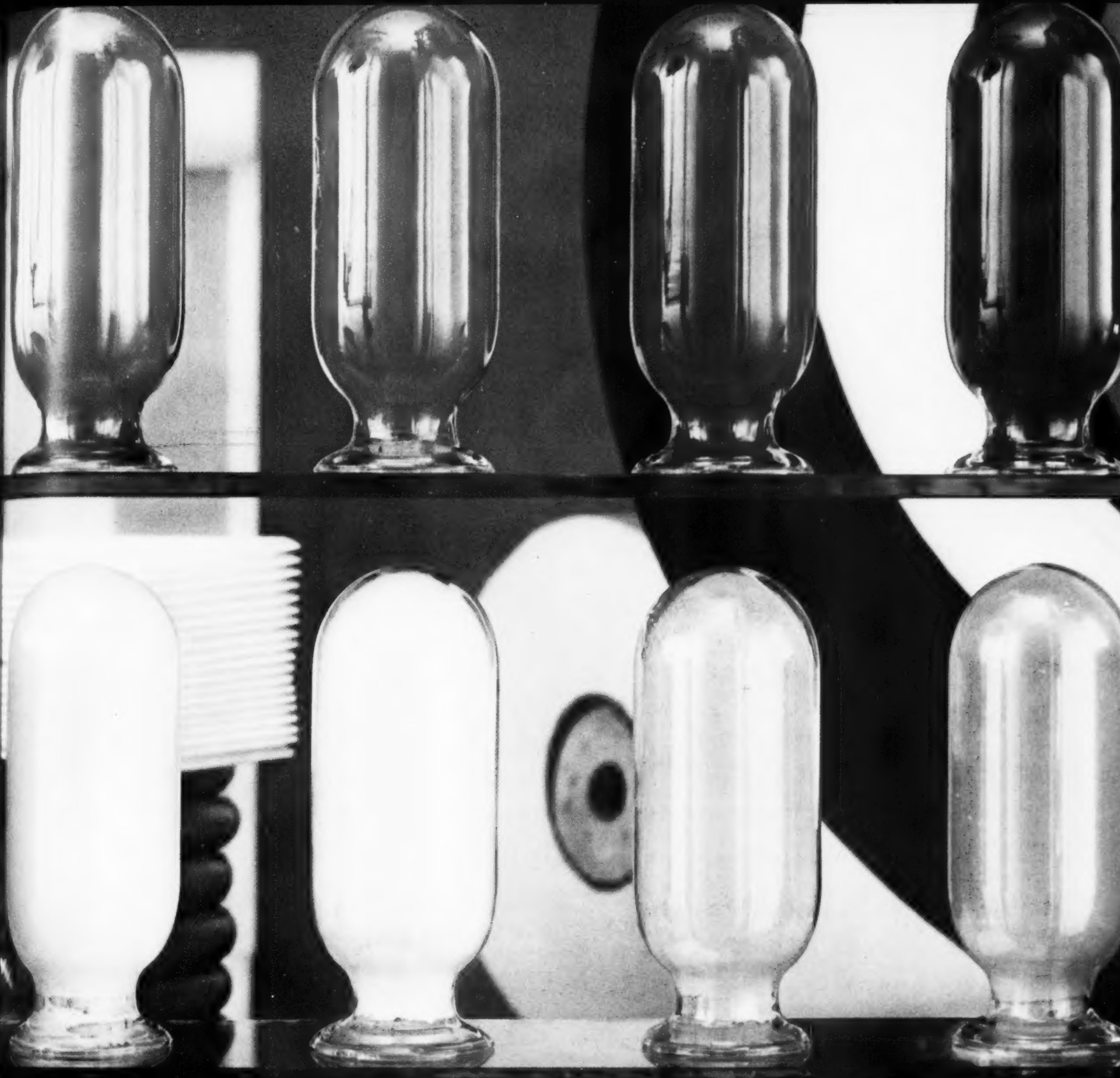
10. Blemished, Imperfect, Defective, Etc., Products. Such imperfections must be disclosed in advertising. In addition, a marking whose meaning is understandable to the public, identifying the defect, must be permanently stamped, molded, or affixed to both tires and wrappings.

11. Safety or Performance Features. Absolute terms like "skidproof," "blowout proof," and "puncture proof" may not be used unless the product affords absolute protection from the implied danger under any and all driving conditions.

12. Other Claims and Representations. No advertising claim shall be made which deceives customers in any material respect—directly, by implication, or by failure to disclose relevant information. This prohibition also applies to false or misleading claims by industry members or by distributors of any component parts of materials used in making industry products. Such claims might be for the merits or comparative merits of component materials that would affect tires as to strength, safety, cooler running, wear, or resistance to shock, heat, etc.

Rubber Definition in New Tariff Schedule

The Rubber Footwear Division of The Rubber Manufacturers Association Inc., is closely analyzing the language of several recommendations being



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Free Acidity, as Acetic Acid	0.10% max.
Ester Content	99.0% min.

Major uses:

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Dimethyl Sebacate

Extreme efficiency • Excellent low temperature properties

Appearance	Clear Liquid or White Solid
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Odor	Neutral
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Free Acidity, as Acetic Acid	0.02 max.
Ester Content	99.0% min.

Major uses:

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drafted by the U. S. Tariff Commission for revision of tariff schedules to determine the probable effect on footwear and possibly other rubber products.

The Tariff Commission study was directed by Congress in the Customs Simplification Act of 1954, and the Commission staff has spent much of the past three years in reviewing the entire tariff schedule set up in the Tariff Act of 1930, with a view to clarifying, simplifying, and consolidating the schedules. Final recommendations must be ready for report to the President and Congress by December of this year.

One of the most important facets of the Commission's restudy is that phase of the project that will include in the tariff schedules definitions of articles and materials which have been discovered, developed, or brought into use since the Act was last revised. Members of the RMA Footwear Division have conferred frequently with the Tariff Commission staff in connection with the drafting of the new language because of concern over the treatment their products might be accorded under revised tariff schedules.

Under Schedule 4—Chemicals and Related Products—the Commission has proposed a definition of rubber and other definitions covering plastics with rubber-like characteristics. Rubber is described as follows in the proposed definition:

"A substance in bale, crumb, powder, latex or other crude form, whether or not containing fillers, extenders, pigments, or rubber processing chemicals which can be vulcanized or similarly processed into materials which can be stretched at 68° F. to at least twice their original length and which, after having been so stretched and the stress removed, return with force to approximately their original length."

The RMA footwear group has the feeling that while this definition would cover natural and many types of synthetic rubber, it might not embrace all of the synthetic materials which have supplanted rubber in many of the industry's products in the recent past. It is their feeling that this might have an important bearing on all rubber manufactures set forth in the tariff schedules, particularly to the extent that any finally approved definition appearing in the tariff schedules might establish a precedent by which it could be extended by implication to other areas.

BDSA Reviews Some Industry Statistics

The Business & Defense Services Administration of the U. S. Department of Commerce issued a weighty statistical report on the rubber industry in June which reviewed where the industry went in 1957 and where it appears to be headed in 1958.

New Plant Outlays

The report first takes a look at new plant and equipment expenditures in the industry and finds that these outlays dropped sharply in the first quarter of 1958 to about $43 million or about 21% below the figure for the last quarter of 1957. Expenditures in the second quarter of 1958 gained 9% on the first quarter when they moved back up to $47 million.

Two things should be noted in regard to these expenditure figures:

•—Comparisons with 1957 are comparison with a peak year—the 1957 total was $1 million less than the record year of 1956 when these expenditures hit $201 million.

•—While the effects of recession may have made serious inroads into new rubber plant and equipment outlays, the industry escaped the more than 20% average decline which has hit such outlays in the entire manufacturing field.

The BDSA report highlights a third key consideration—the increase between December, 1957, and January, 1958, in seasonally adjusted rubber industry sales. These climbed from $427 million in December to $448 million in January.

Rubber Use Statistics

The report also examines another broad area, U. S. rubber production and consumption trends over the past three years. It finds that consumption of new rubber totaled 1,464,640 long tons in 1957, the second highest year. The 1957 total was down 4.3% from 1955, the peak, but up 2% above the 1956 total.

Consumption in 1957 did not show a downward trend until the fourth quarter and then only moderately. In January and February, 1958, however, consumption fell again to a level about 17.2% below that for the same period of 1957. According to the report, a sizable portion of the decrease was due to reduced deliveries of tires and other rubber products to automobile and truck manufacturers for original equipment.

The BDSA statistics show that consumption of natural rubber compared to total new rubber continued to decline in 1957—36.8% against 39.1% for 1956 and 41.50% for 1955. As the agency assesses the drop, the 1957 reduction was largely in the tire and tire products segment, down from 40.6% to 37%. In nontire production, the drop was less than one-half of 1%.

Percentage-wise the use of natural rubber latex showed a very small downward trend in 1957—46%, compared with 46.8% in 1956. Dry natural rubber use declined to 35.6% in 1957 from 38.2% in 1956 and 40.3% in 1955.

Usage of synthetic rubbers has gained steadily in the past three years, BDSA says without apparently aiming at understatement. Compared with total usage, the percentages are as follows: 1957, 63.22%; 1956, 60.87%; 1955, 58.50%. Neoprene, butyl, and nitrile type rubbers collectively have shown percentage gains each year, but SBR has accounted for the major increases by the following percentages: 1957, 52.38%; 1956, 50.40%; and 1955, 48.51%—or roughly 80% of the increases made by all synthetics in the three-year period.

Production of synthetics moved steadily forward from 970,468 tons in 1955 and 1,079,574 tons in 1956 to 1,118,173 tons in 1957. At the end of 1955, according to BDSA, inventories were very low, and some of the 1956 production was channeled to building them to a more realistic level. Butyl stocks were substantially increased, which accounts for the high production of that synthetic in 1956—production which did not reoccur in 1957.

Synthetic exports, where a good part of the synthetic story was written during the period, registered a 36% gain in 1957 over 1956 exports and a more-than-100% gain compared with 1955 figures. Neoprene exports were up 38% over 1956 exports; while butyl and nitrile type rubbers made smaller gains. SBR again took the lion's share as it rose 40% above the 1956 figure to total 158,017 long tons in 1957.

BDSA statistics show that gross production of SBR plants totaled 938,380 long tons in 1957; 820,986 long tons of which were copolymer content, 86,638 tons were oil, and 30,846 tons were carbon black. SBR cold rubber increased in percentage to 82% of the total in 1957.

•

Extrude Vinyl Sheeting

National Rubber Machinery Co., Akron, O., and B. F. Goodrich Chemical Co., Cleveland, O., jointly have announced the first successful extrusion of vinyl in the form of wide, heavy-gage sheeting with exceptionally close tolerances. Experimental work at the NRM laboratory produced a 52-inch wide sheet of rigid unplasticized vinyl 130 mils thick with a tolerance of plus or minus 4 mils. This continuous-length extrusion was made possible through the development by NRM of a new flat-type sheet die. The fast, but precise new method is expected to reduce costs to a fraction of those previously experienced. The material extruded was Geon 8700A supplied by Goodrich Chemical. Other vinyl copolymers and plasticized materials have since been extruded.

INDUSTRY NEWS

Problems of United States Economic Development Covered in Recent Survey

The Committee for Economic Development, New York, N. Y., has recently published the best 50 papers from a recent competition conducted by the Committee on the question, "What is the most imporant economic problem to be faced by the United States in the next 20 years?" The winners were announced, and the 50 papers published in "Problems of United States Economic Development—Volume 2," on June 11. CED had earlier conducted a symposium on the same question and these papers were published December 29, 1957. The second volume is now available from CED at $2.50 a copy.

Grave concern over America's goals, its sense of values and direction, was the predominant theme of the papers published in Volume 2. The second largest group of winners picked inflation as the most pressing future problem (eight papers), and how to ward off a severe depression was a close third (six papers).

Charles F. Andrew, director of planning and economics for the United Carbon Co., was one of the 50 prize winners (a $500 award went to each winner) with a paper on "The Control of Inflation." In its simplest terms inflation is defined as a rising price level or a falling in the value of money; it is the overlap also between politics and economics, Mr. Andrew said. Inflation is important because it hits everywhere. Inflation, being a problem of the value of money, is thus related to the mysterious area of banking, fiscal policy, and international finance, he added.

For limited periods and in small doses, inflation seems desirable, particularly when an economy has been through a depression. There is usually a lag between the true start of prosperity and the public's awareness of it. Measures are taken to combat deflation when inflation is the real problem.

Unfortunately, the way to go after inflation as such is indirect and unpopular. Probably most responsible groups over the world know in principle what should be done, but voluntary action to combat inflation by labor business, or private persons is unlikely to work.

Taxation policy might appear to be the best way to combat inflation since it is less direct than price controls. The most skillfully designed tax bill is bound, however, to penalize some group or interest arbitrarily. Taxes should be higher in inflationary times so as to remove purchasing power from the market, but if the government spends this tax money instead of retiring the debt, no good is accomplished.

The crux of the inflation problem is the price of money, Mr. Andrew says. If money can be made more expensive to obtain, the demand for it will be reduced, and as its use in circulation and investment is inhibited, the pressures on prices will be relieved.

If we can keep inflation from passing beyond our control, the orderly expansion of the U. S. economy and the parallel economic development of the rest of the world can proceed to a point where a high standard of living is available to all. Otherwise monetary chaos, bankruptcy, international crises, and political upheavals will continue, and finally, if the United States cannot demonstrate leadership in solving this problem, other less fortunate countries unable to do so on their own, may turn from free enterprise to a system which might appear to them to be the answer —a controlled economy, Mr. Andrew concluded.

Prof. Robert D. Entenberg, of the University of Pittsburgh, in his paper, took the position that the most important economic problem facing this country in the next 20 years will be to find the best ways and means to absorb the tremendous increase in the productive capacity of the United States. Total demand has not kept pace with this enormous growth in productive facilities, and unless total demand can be increased and sustained at much higher levels than has been evidenced during the past decade, full employment and gradual increases in gross national product and income cannot be maintained indefinitely.

Joseph M. Gillman, economist, stated that the most important economic problem to be faced by the United States in the next 20 years is the creation of socially useful outlets to substitute for present-day military expenditures in the maintenance of full employment, assuming that World War III is unthinkable.

Benson Soffer, of Brookings Institution, in his paper, entitled "The 'Parity' Concept and Destabilizing Wage and Price Increases," felt that the most important economic problem of the United States during the next 20 years will be to develop effective policies to cope with the destabilizing wage and price increases that have resulted from both public and private guarantees that selling prices will rise in step with buying prices. These guarantees have taken the following forms: parity price supports for basic farm products; the escalator—annual deferred wage increase provisions in long-term collective bargaining agreements; and policies that require price rises in proportion to increased wage rates. These applications of the "parity concept" have been sufficiently extreme so that they have actually become incomparable with price stability, as well as inequitable to those who must pay, but who cannot charge, parity price.

Prof. E. Bryant Phillips, of the University of Southern California, in his paper, "The Need for Balance among Economic Pressure Groups," feels that an economic problem that is fundamental, serious, and immediate, and yet is scarcely recognized is the problem of educating consumers in this country so that they may raise their own level of living and become, at the same time, a countervailing force with strong business and labor groups. It is expedient that consumers should be aroused, but it is equally expedient that the transition may be made without malice and without disturbance to America's unsurpassed production system.

Other papers covered a wide range of subjects including lack of investment capital, adjusting the economy to the nuclear age, the abandonment of arbitrary retirement ages, foreign economic policy, and material resources.

Paradoxically three of the winners, writing in a contest conducted by an organization comprised predominantly of business executives (CED), strongly criticized certain effects of current big business attitudes and practices.

Card for Belt Users

United States Rubber Co.'s mechanical goods division, Passaic, N. J., has announced the availability of a handy slide card which affords a quick method for finding the probable causes of conveyor belt troubles, and lists specific cures. This card is the latest in a series of aids offered by the company for the engineering, purchase, and maintenance of conveyor belts. It lists 20 of the problems most frequently encountered by conveyor belt users.

Three New SBR Numbers Assigned by ASTM D-11

Committee D-11 on Rubber and Rubber-Like Materials of the American Society for Testing Materials through Subcommittee 13 on Synthetic Elastomers of D-11 has assigned numbers to three styrene-butadiene elastomers (SBR), SBR 1506 and SBR 1804, requested by Shell Chemical Co., and SBR 2109, requested by Copolymer Rubber & Chemical Corp.

TABLE 1. DESCRIPTION OF TYPES OF STYRENE-BUTADIENE (SBR) ELASTOMERS—ASSIGNMENT OF NEW CODE NUMBERS—ASTM D 1419-56T AND ASTM D 1420-56T

Number as assigned	1506	1804	2109
Date assigned	3/24/58	3/24/58	5/20/58
Requested by	Shell Chemical Corp.	Shell Chemical Corp.	Copolymer Rubber & Chemical Corp.
Distinctive feature	low-viscosity-alum coagulation	low oil-high black	medium high solids-cold rubber latex—high bound styrene content
Close previous number, if any	1502, S 7551	1803, S 7551	—
Type	1506	1804	2109
Nominal temperature, °F.	43	43	50
Activator	FRA	FRA	FRA
Shortstop	ND	ND	ND
Catalyst	OHP	OHP	OHP
Emulsifier	mixed	RA	FA
Nominal conversion, %	60	60	60
Nominal Mooney viscosity, ML 1 + 4 (212° F.)—			
polymer	25	—	—
Compound	—	62	—
Nominal residual volatile, unsaturate, %	—	—	0.1
Nominal pH value	—	—	10.5
Nominal coagulum on No. 80 screen, %	—	—	0.10
Nominal bound styrene, %	23.5	23.5	40
Coagulation	alum	SA	—
Carbon black type	—	HAF	—
%	—	35.3	—
Oil type	—	HI-AR	—
Parts	—	10	—
Finishing	normal	normal	—
Nominal total solids, %	—	—	39.5

Note: Abbreviations and symbols are defined as follows: FRA = free radical type; ND = non-discoloring; OHP = organic hydroperoxide; SA = salt acid; HI-AR = highly aromatic; RA = rosin acid; FA = fatty acid.

Irradiation and Other Tests of Airplane Tires

The Goodyear Tire & Rubber Co. Akron, O., as a result of tests exposing airplane tires to nuclear radiation, has indicated that tires made of either natural or synthetic rubbers are feasible for future atomic-powered aircraft. In tests conducted at Goodyear's cobalt 60 radiation laboratory and at the Oak Ridge atomic plant, tires were exposed without detrimental effect to gamma rays and neutrons. By the use of nitrogen, in lieu of air for inflation, the beneficial results could be obtained. The nitrogen, in diffusing through the tires, formed a protective cloak around the cords, thus preventing their degradation, it was reported. Tire materials tested include natural rubber, nylon, rayon, Dacron, and various other elastomers and cord fabrics.

The work is being done as an effort of the tire manufacturer to stay abreast —if not somewhat ahead—of aeronautical manufacturers already at work on future aircraft.

Speed

Another of the main current problems is high speed, it was said, particularly extreme landing speeds to which the tires are being subjected. Current guided missiles require tires capable of landing speeds of 346 mph.; while commercial aircraft, such as the Boeing 707, Douglas DC-8, and Convair 880, are now requiring landing speeds in the 200-mph. range. The tire company is receiving inquiries in the 400-mph. range, at which airplanes probably will be landing by 1960.

At 230 mph. an 18x4.4 airplane tire revolves 4,800 times per minute. Standing waves—three to four per revolution —cause the tire to flex approximately 15,000 to 20,000 times per minute. The considerable heat generated makes the tire prone to premature failures. Goodyear is attacking this problem by evaluating various types of compounds, fabrics for strength and adhesion, various types of design configurations, production improvements and inspections.

Load and Inflation

High loads and high inflation pressures constitute another major problem area for the airplane tire designer. Current requirements call for 21,300 pounds load rating at 385 pounds of air pressure per square inch, a vast increase in requirements of those of ten years ago. Aircraft tires cover a wide range of inflation pressure—from five psi. for such tires as Goodyear's low-flotation Airwheel tires, to 385 psi. to obtain the smallest possible tire size with maximum load-carrying capacity. Certain U. S. Navy airplane tires require operating pressures of 615 psi. for use aboard aircraft carriers and a test burst pressure of 1,500 psi.

Temperature

One of the most perplexing problems confronting Goodyear engineers is the design of aircraft tires to operate at temperature extremes ranging considerably beyond —65° F. for high altitude operations to 800° F. resulting from skin friction at supersonic speeds. Currently, aircraft manufacturers are refrigerating stowage compartments but at an extreme penalty of weight, space, and cost.

Goodyear in challenging this problem, has already adapted an oven to one of its dynamometers in which tires may be heated to 550° F. and then landed against the dynamometer flywheel for dynamic testing. In conjunction, the company is working on different types of polymers and cords to meet elevated temperatures.

Timken To Invest

An investment of $51 million in new equipment and facilities covering the next five years is being planned by The Timken Roller Bearing Co., Canton, O. Already more than $3 million worth of new grinding and finishing equipment has been ordered for installation in the Canton, Columbus, and Bucyrus, O., plants. An additional $2.5 million will be spent, increasing grinding and finishing productivity by an anticipated 30%.

Initial estimates indicate that about $3.5 million will be spent for new screw machines for the Bucyrus bearing plant. Roller header machines will be modernized at a cost of $400,000, with the work to be completed within the next two years. Over the next five years $1 million will be spent for heat treating equipment at Canton and Columbus. Additional funds, amounting to $16.25 million have been earmarked for a variety of other capital improvements in the bearing and rock bit plants, to be spent at the rate of about $3.25 million per year.

The steel and tube division will spend a total of $12.5 million during the same period on new equipment and modernization of machinery. Foreign operations of Timken have been allotted approximately $12.5 million for expansion and improvements during this same period, it was also reported by the company.

BFG Adds Tire Sizes

B. F. Goodrich Tire Co. Akron, O., has added three sizes to its line of tires for the growing foreign-car market —the six-ply rated 5.75-15 for the Simca station wagon and the four-ply rayon 5.20-12 and 5.00/5.20-14 for Fiat cars. The three sizes are tube-type tires, available in both black and white sidewall. The 5.75-15 is manufactured by Kleber-Colombes Co., B. F. Goodrich's associate company in France; while the two other sizes are produced by the BFG associate firm in Holland, the Vredestein Co.

With these additions Goodrich is now making 16 tire sizes available to owners of practically all imported cars sold in the United States. Three of the 16 sizes, including the 5.60-15 for the Volkswagen, are manufactured in BFG plants in the States. The remaining 13 are imported from BFG associate plants in France, Germany, the Netherlands, and Sweden.

A number of other sizes, which BFG has been manufacturing for American built cars for several years, are also available for use on certain foreign cars. These include the 6.00-16, the 6.50-16 and sizes 6.40 through 8.20 in the 15-inch diameter series.

Blaw-Knox Starts Work on Japan's SBR Plant

An example of how American technology is spanning the world is evident in the engineering work of Blaw-Knox Co.'s chemical plants division, Pittsburgh, Pa. As a result of a contract just received, Blaw-Knox is beginning work on the design of Japan's first synthetic rubber plant.

At the same time, engineers from the firm are placing into operation Great Britain's first SBR synthetic rubber plant at Fawley, England. The move from a project in one country to projects in other countries is said to be nothing new for the engineering firm, but this particular succession of developments indicates the growing international interest in synthetic rubber.

The contract to Blaw-Knox calls for the engineering and the design of a plant for the Japan Synthetic Rubber Co. to be located near Yokkaichi, which will have a capacity of 45,000 long tons of SBR rubber per year.

The investment in the project will amount to $30 million, said to be one of the largest single-process plant projects ever undertaken in Japan. Included will be facilities for feed material preparation, butadiene production and extraction, copolymerization, and the necessary supporting auxiliaries.

The basic engineering design, such as that needed to develop material and utility balances, process flow sheets, functional equipment, and certain specifications, will be performed in the Blaw-Knox Pittsburgh offices. After the engineering data are shipped to Japan, a Blaw-Knox field staff will manage the project during detailed engineering, construction, and initial operation.

The company's most recent projects in the U. S. involved the reactivation and modernization of two of the country's largest synthetic rubber plants—at Institute, W. Va., and at Louisville, Ky. The company also served Goodyear Tire & Rubber Co. in its expansion program at Houston, Tex.; this plant is now the world's largest single producer of dry-type SBR.

UCC To Build Lab

Union Carbide Corp., New York, N. Y., recently announced that construction will proceed on the Union Carbide Chemicals Co.'s technical service laboratory originally planned at its Westchester County property at Eastview, near Tarrytown, N. Y. It is anticipated that construction will start in about a month and that the laboratory will be completed and ready for occupancy by late 1959 or early 1960.

In February the corporation deferred its plans to develop the Westchester site pending further study. Construction of the technical service laboratory was decided upon to expand facilities necessary to broaden the scope of customer service and application research. This is regarded as a vital element of the firm's present and future marketing program, it was announced. The status of the other buildings originally planned for the site remains unchanged.

The laboratory will both expand and centralize the facilities of Union Carbide Chemicals Co. for the development of technical information to solve customers' problems and to conduct application research on new products. At present the company's customer service and application research is carried on at several locations, including South Charleston, W. Va., Whiting, Ind., and affiliated company laboratories at Bound Brook, N. J., and Tonawanda and Millwood, N. Y.

Centralizing of the technical service functions at Westchester is part of the long-term planning of the company to increase its activities in applied research and to extend its service to a growing number of markets.

Lawrence A. Wood

Commerce Department Award to L. A. Wood

Lawrence A. Wood, chief. Rubber Section, National Bureau of Standards, has received the Meritorious Service Award of the United States Department of Commerce. Dr. Wood was cited for valuable fundamental contributions to the science and technology of rubber, for extremely competent performance of official duties for many years, and for highly distinguished authorship.

The award recipient received his A.B. from Hamilton College in 1925 and his Ph.D. in physics from Cornell University in 1932. He joined the National Bureau of Standards in 1935 and has been chief of the Rubber Section since 1943.

Dr. Wood is a fellow of the American Physical Society, a member of the American Chemical Society, the Philosophical Society of Washington, and the Washington Academy of Sciences. In 1943 he received the Award of the Washington Academy of Sciences for outstanding achievement in research in physical sciences. He was one of the founders of the Division of High Polymer Physics of the APS and chairman of the Division in 1947. As retiring president of the Philosophical Society of Washington for 1955, he presented a paper in January, 1956, on "The Elasticity of Rubber." An outstanding authority on synthetic rubber, he has written many technical papers in his field, for which he has gained national and international recognition. One of his most recent publications is entitled, "Stress-Strain Relation of Pure Gum Rubber Vulcanizates in Compression and Tension," and appears in the March, 1958, issue of the *Journal of Research of the National Bureau of Standards.*

Botau in New Post

Michel Botau has been appointed chief rubber chemist at Ro-Search, Inc., Waynesville, N. C. Prior to joining Ro-Search he was chief chemist for four years at A. C. Rubber Mfg. Co., Ltd. Vancouver, B.C., Canada, where he was largely responsible for the expansion of the company in adhesives and protective coatings.

Shown with J. H. Gerstenmaier, *center*, manager of industrial products development, *left to right*, are: R. H. Miller, E. C. Montgomery, A. R. Hacker, C.E. Taylor, F. O. Leonard, and A. B. Hirtreiter

Goodyear Advances Six

Six new positions have been established in the development organization of the industrial products division, Goodyear Tire & Rubber Co., Akron, O. A. R. Hacker, A. B. Hirtreiter, F. O. Leonard, R. H. Miller, and E. C. Montgomery have been named chief engineers for prescribed areas of development work. C. E. Taylor has been appointed chief chemist for the division's hose plant at North Chicago, Ill.

The function of the new organization will be to plan, coordinate, and control all phases of compounding, design, and technical service for the division. These men will coordinate development and planning efforts in harmony with the planning and needs of the division's sales departments.

Hacker has been assigned to conveyor belt development. Hirtreiter will head up development work on automotive suspensions; while Leonard will coordinate development activities for special industrial products. Miller will concentrate on rubber flooring and automotive mats and Montgomery will conduct development operations for tank lining and industrial rolls.

Taylor, who will be stationed at Akron for the time being and serve in the same capacity as the five chief engineers, will move to North Chicago when research and development facilities for hose are completed there.

RMA's Hach Retires

John P. Hach, secretary of the Rubber Manufacturers Association's Coated Materials Division, retired on July 1, after 14 years with the Association. Mr. Hach spent his entire business life in the rubber industry. In retirement, he plans to move from New York back to New England where he first entered the coating industry with the L. C. Chase Co. of Boston. He later was employed by the Reading Rubber Mfg. Co. and its associated companies, first as traffic manager and then as general manager and assistant treasurer.

Mr. Hach was honored at a meeting of the Coated Materials Division on May 14 at the Biltmore Hotel, New York, N. Y., when his retirement was announced. He was presented with an illuminated plaque by J. H. Mason, chairman of the board, Haartz-Mason, Inc., as a suitable memento of the occasion. The text of the plaque read as follows:

"The Coated Materials Division of The Rubber Manufacturers Association, Inc., presents this testimonial to John Peter Hach to symbolize the great affection in which its members hold him and their sincere appreciation of his devoted and constructive efforts during the past fourteen years as Secretary of this Division.

"As he retires after a business lifetime in the Rubber Manufacturing Industry, we cite the unfailing friendliness, constant helpfulness, outstanding diligence and integrity, infinite patience and devotion to duty which have always characterized his valued services to this Division.

"It is our earnest hope that he may enjoy many happy and healthful retirement years."

The plaque was signed by RMA President Ross R. Ormsby and Herbert Bremner, Hodgman Rubber Co., chairman of the Coated Materials Division.

After July 1, the activities of the division will be handled by C. H. Hardy, and the activities of the division's standardization committee bv E. C. McKeon, both of the RMA staff.

Barrett To Split

In the near future Allied Chemical Corp., New York, N. Y., will create two separate divisions to manufacture and market the product lines now handled by its present Barrett Division, the company announced.

Barrett's long-established lines of roofing, building, and paving materials will be separated from the plastics and coal chemicals and will continue to be manufactured under the Barrett Division name. H. Dorn Stewart will be appointed president of Barrett division. Formerly with Armstrong Cork Co., he joined Allied in April as assistant to the executive vice president.

The manufacture and sale of plastics, resins, and industrial chemicals will be conducted by the plastics and coal chemicals division. T. J. Kinsella, head of Barrett since 1952, will be the president of that division.

This change will make possible intensified concentration on research, customer service and the development of specialized markets for each of the product lines involved. Allied's growing stake in plastics and the potential from new building materials facilities will be considerably strengthened by this realinement, the company stated.

Cable Sealant

Union Carbide Corp.'s silicones division, New York, N. Y., has announced the availability of Union Carbide K-1999 Silicone Cable Sealant which is designed specifically for use in cable produced to meet MIL-C-19381A Special-Purpose Electrical Cable (Nuclear Plant) Specifications. The sealant can be easily pumped with conventional handling equipment while still passing the drip test specified. It is said to be effective in the range of —60 to 500° F. and requires no heat curing. Its properties make it attractive for sealing and calking applications where temperature stability and inorganic characteristics are required. K-1999 consists of heavy grease compounds with a specific gravity of 1.66 $\pm$0.06. White in color, it has a flash point of greater than 340° F. and a Williams plasticity of 160 $\pm$40. It is available in commercial quantities of one pound net and up.

Durez Now Autonomous

The Durez Plastics Division of newly named Hooker Chemical Corp., formerly Hooker Electrochemical Co., has been decentralized and will now operate as an autonomous division of the company. Production, sales, and profits, it was announced, now become a Division responsibility. The three facilities involved are the Division's headquarters plant at North Tonawanda, N. Y., manufacturing synthetic resins and molding compounds; the Kenton, O., plant which manufactures phenolic molding compounds; and the Spokane, Wash., plant making wood flour, a major additive in many molding compounds.

The staff departments such as purchasing, advertising, public relations, accounting, and legal will continue to provide, in these areas, the major needs of the Durez Division, as well as those of other plants, from the company's headquarters offices in Niagara Falls, N. Y. The division's labor relations and plant engineering will be handled from North Tonawanda. General policy direction for industrial relations, sales, and other functions will continue to be administered by officers at the Niagara Falls headquarters, the company said.

In the decentralization J. C. Searer, formerly Division works manager, becomes Division general manager, reporting to the president, T. E. Moffitt. A. W. Hanmer, Jr., continues as Division general sales manager, while C. Y. Cain becomes Division assistant general sales manager. J. F. Snyder, Jr., is now production manager for the Division, and W. J. Parmley has moved to Kenton as superintendent. L. A. Sontag will continue as Division technical manager.

At a recent stockholders' meeting the company name was changed from Hooker Electrochemical Co. to Hooker Chemical Corp.

Ship Hull Cushions

Pneumatic ship fenders, shaped like a barrel and built like an automobile tire, are being used by the United States Navy to protect ship hulls. Built by The Goodyear Tire & Rubber Co., Akron, O., the pneumatic fenders act like giant air cushions in absorbing shocks when two ships or a ship and a dock come together.

Goodyear expects private shipping to employ pneumatic fenders for certain types of docking. Oil companies engaged in off-shore drilling operations are testing the fenders also as a means of cutting ship and rig damage during ship-to-shore supply operations.

Navy officials ordered the new-type fenders to protect the hulls of a destroyer fleet nested together in mothballs at Atlantic fleet destroyer headquarters in Rhode Island. But when the first pneumatic fenders were delivered, it was decided to try them in working fleet operations.

The idea to cushion ship hulls with air worked. Use of pneumatic fenders enables Navy ships to remain nested together without damage during storms.

Pneumatic ship fenders are built much like a premium-grade passenger-car tire. The carcass is much wider, and the steel bead diameter is smaller. Metal plates are built in the ends and equipped with swivels so that the fenders will roll with a ship and cushion against shock.

Du Pont Opens New Lab

Opening of a new $5-million laboratory to provide service to customers and for evaluation of new or improved products of electrochemicals and pigments departments of E. I. du Pont de Nemours & Co., Inc., Wilmington, Del., was announced May 21.

Although some facilities are shared jointly by the two departments, the building houses separate laboratories for product development in paint, metals, textile, plastics, paper, ink, rubber, and allied fields.

For both departments, the laboratory provides a center for research work on problems of customers, for customer visits, development work on new products and new uses for established products, and training of field representatives. Sales service facilities for the electrochemicals department formerly were maintained at its Niagara Falls, N. Y., plant. The pigments department formerly operated separate service laboratories at Newark, N. J., and at its Newport, Del., plant.

The laboratory contains 81,000 square feet of floor space, including 150 separate rooms, laboratories, and demonstration areas. The technically trained staff of 130 includes chemists, chemical engineers, metallurgists, and other specialists.

The pigments laboratory occupies two floors and has facilities for developing tailor-made pigments for the paint, plastics, rubber, paper, ink, and other industries. It contains 40 laboratory and testing rooms for developing new end-uses for pigments and demonstrating to customers how they can make better use of pigments in their products. Included are specialized laboratories for testing pigments in paint, plastics, roofing, textile, ink, and paper. Other areas contain ball mill and roller grinding, spraying, accelerated weather testing, and oven baking equipment.

Special equipment includes a textile spinning machine, for processing of mass pigmented fibers, plastics extruder, roofing granule machinery, rubber mills, paper making and calendering, and a printing press.

Other facilities determine pigment performance under controlled conditions. An indoor test room, with a 50-foot glass wall, provides uniform northern exposure for test panels. Outdoor test panels are prepared in another area and installed at the nearby test farm.

The electrochemicals wing is divided into four major product areas—peroxygen, vinyl, sodium, and chlorine. Seventeen individual laboratories are grouped around large demonstration areas in which there is extensive equipment which duplicates customers' operations on a semi-works scale.

In the peroxygen area, latest equipment is available for bleaching textiles, paper, and other products. Another area is devoted to polyvinyl alchol and polyvinyl acetate, including end-use evaluation in paints, adhesives, paper coatings, and other products.

The red brick and steel frame structure is similar architecturally to other sales development laboratories on the Chestnut Run site, operated by the company's textile fibers, polychemicals, and film departments and one operated jointly by the elastomer chemicals and organic chemical departments.

FMC's New Division

The chemicals and plastics division is the new name for Food Machinery & Chemical Corp.'s organic chemicals division, it was recently announced. The new name reflects the increasing concentration of the division on resin and plastic work. The division's Dapon resin (diallyl phthalate prepolymer) is finding increasing applications in molding and laminating fields. A number of new resins and plastics are under active development for early offering.

FMC's chemicals and plastics division also manufactures allyl and methallyl monomers and a broad range of Ohio-Apex plasticizers, as well as organic chemicals derived from phosgene and acetoacetic ester reactions. These include carbamates, chloroformates, carbonates, methyl ketones, and substituted acetoacetic esters.

Headquarters of the chemicals and plastics division is at 161 E. 42nd St., New York 17, N. Y., and plants are at Nitro, W. Va., and Baltimore, Md.

Correction

In the May, 1958, issue of RUBBER WORLD, page 300, a news brief write-up incorrectly refers to a non-existing adhesive, Chemlok 605. The correct adhesive, manufactured by Lord Mfg. Co., Erie, Pa., is Chemlok 607. Chemlok 607 is an excellent adhesive for bonding the new Du Pont fluorocarbon elastomer, Viton A, to steel, copper, brass, aluminum, titanium, magnesium, chrome-plated steel, and other substrates.

High-Speed Test Track

A specially designed, carefully detailed rubberized asphalt road, finished to extremely close tolerances, has been built by The Goodyear Tire & Rubber Co. near San Angelo, Tex., for the purpose of testing tires at high speeds. Designed and built for test work exclusively, the unique facility will be used by the company to conduct tire tests safely at higher than legal highway speeds to develop new and safer tires for normal driving.

The road, part of a multi-million-dollar test proving ground Goodyear is building, actually is a perfect-circle, five-mile banked track designed for automobile speeds up to 140 mph. and capable of handling speeds up to 160 mph.

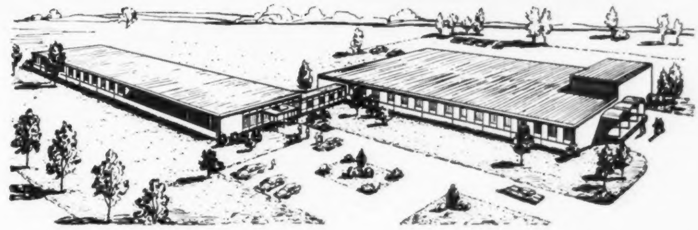
With a contour surface of two parabolic curves, the circular track is so designed that at speeds of 80 to 140 mph. it cancels side forces, resulting in the equivalent of a straight roadway of infinite length. Because of its unusual design, the rubberized asphalt paving, scientifically finished to conform to the parabolic curve is something of an engineering achievement. Carefully detailed planning, continual testing, specially designed paving equipment, and entirely new paving techniques were necessary to complete the high-speed test track.

The paving on the new Texas test track is hot-mix asphalt three inches thick. It was laid in two thicknesses of 1½ inches; the top layer is rubberized by the addition of Rubarite, a product specially developed by Goodyear for asphalt paving applications. Rubarite, in the form of a finely divided powder, is a free-flowing coprecipitate of sericite mica and synthetic rubber.

Use of Rubarite in asphalt paving mixes is said to result in a longer life road surface that is more uniform in texture and more flexible at low temperatures. Such mixtures have high adhesive strength and are said to be six to eight times stronger than ordinary asphalt mixes. Where an ordinary asphalt paving mix tends to become brittle with age, rubberized asphalt retains its elasticity. Chief advantages of using Rubarite, claims Goodyear, are superior ability to withstand changing weather conditions, rugged durability to wear longer, greater resistance to stripping, oxidation, and bleeding and reduced maintenance costs.

Distance around the perfect-circle track is five miles, with a diameter of 1.6 miles. Width of the pavement is 30 feet. Maximum angle at the top of the outer edge is 26 degrees. About 15,000 tons of asphalt mix, including Rubarite, were required for the paving.

The track was designed by Goodyear's tire test division and engineered by Fisher Construction Co., Phoenix, Ariz. All construction work, including paving and design of special equipment for grading, rolling, and paving the parabolic curved track, was done by Strain Bros., Inc., San Angelo. Goodyear's engineering department in Akron, O. supervised engineering and construction work.



Architect's sketch of Columbian Carbon's new research laboratories

New Columbian Labs

Enlarged facilities for Columbian Carbon Co.'s research will be provided by the end of 1958 in the company's new million-dollar research headquarters now under construction on Plainsboro Road near Princeton, N. J. Facilities will cover present and expected needs in all phases of research and development on carbon black, pigments, and related fields.

The new research headquarters comprise two one-story buildings connected by a 10-foot corridor. Building No. 1, with a total floor space of 12,000 square feet, will contain the main entrance, reception area, administrative offices, library, file rooms, and a group of six laboratories devoted to basic chemical and physical research.

These six labs include control testing, analytical research, physical chemical research, organic research, biocolloid research, and physical research. The physical research laboratory will be equipped with electron microscope, X-ray and associated equipment. Standard chemical benches and hoods, service facilities, and laboratory apparatus will be adequate for basic investigations on carbon blacks and pigments and also for fundamental research on new programs.

Building No. 2, with 18,000 square feet, will contain a group of seven large laboratories devoted to development and application research; the lunchroom; large conference room; machine and maintenance shops; shower and locker rooms. The largest laboratories in this group are assigned to the rubber division, with a mill-press-preparation room and a test room. With its adjacent offices, file room and storage rooms, the rubber division will be a compact, integrated unit designed to carry on parallel research and technical service activities. Of the remaining five labs, the largest unit will be the pilot-plant area, designed for flexibility in pilot-scale operations. The other four labs will be assigned to development and process studies.

Columbian's present research facilities which now are in Brooklyn, N.Y., will be brought to the new research headquarters.

View of portion of Goodyear's new Texas test track

UEF Expanding

United Engineering & Foundry Co., Pittsburgh, Pa., at a recent meeting of the board of directors, elected to expand the company's plant at Vandergrift, Pa., at an estimated cost of \$1,750,000. The expansion will encompass extensions to both casting and steel roll finishing buildings. The tendency of the metal rolling industry, over the past few years, to require larger and heavier equipment has reached a point where it is desirable to prepare for future demands of more and even larger rolls and machinery, stated the company.

NEWS BRIEFS

B. F. Goodrich Chemical Co., Cleveland, O., reports that its Geon polyvinyl material is being used to impregnate and coat a completely new type of screening made of glass fibers which gives promise of being the most colorful and carefree screening ever offered to home owners. Developed by the textile products division of Owens-Corning Fiberglas Corp., the screening is said to be rustproof, flexible, exceptionally strong and resilient, and extremely lightweight, weighing only four pounds per hundred square feet. Glass fiber yarns are covered with Chem-o-sol, a vinyl plastisol formulated by Chemical Products Corp., East Providence, R. I. The plastisol is based on a Geon polyvinyl material supplied by Goodrich Chemical. The Geon vinyl coating holds the weave together. After weaving, the vinyl is softened under heat. When it cools, all intersections of the weave are virtually welded together, strengthening the mesh and eliminating raveled edges.

United States Rubber Co. has established a new automotive sales department, with headquarters in Detroit, Mich., to coordinate sales to the automotive industry of the various products manufactured by all of its operating divisions. Walter D. Baldwin has been appointed vice president in charge of the newly formed department. He was formerly assistant general manager of the company's tire division. Under his direction, the new department will coordinate sales of more than 130 different rubber, plastics, and textile automotive products. Included are such items as tires, automotive upholstery materials, foam rubber, parts for interior trim, dashboard crash pads, steering wheels, and a wide variety of rubber-to-metal mountings.

B. F. Goodrich Aviation Products, Akron, O., has reported that its new-type brake system,[1] designed to meet the increased energy conditions of jet aircraft, has successfully completed taxi and flight tests on the Boeing 707 jet transport prototype, manufactured by Boeing Aircraft Co., Seattle, Wash. With the liquid-cooled brake system, all hydraulic fluid is eliminated from the brake, it was reported.

[1] See Rubber World, Apr., 1958, p. 123.

The Dayton Rubber Co., Dayton, O., has borrowed $11,400,000 from the Equitable Life Assurance Society of the United States through the issuance of 4⅝% long-term notes, it was announced. The notes are due serially from December 1, 1959, to December 1, 1971. Proceeds will be used to retire existing long-term notes and to equip a new mechanical rubber goods plant to be constructed in Springfield, Mo. The balance will be added to working capital. The new plant will have approximately 175,000 square feet of manufacturing space and will employ several hundred persons initially.

Thiokol Chemical Corp.'s chemical division has centralized its polyurethane technical service and marketing groups at facilities obtained from Thiokol's Hunter-Bristol division, Bristol, Pa. Jack Borsellino has been named manager of Thiokol's polyurethane program. He came to Thiokol in 1950 as a research chemist and, since 1954, has been a group leader in the company's new product section. Thiokol has two groups of urethane resins which it is marketing: Rigithane, a polyurethane foam formulated for thermal insulation, sound absorption and packaging; and Solithane, for castings, electrical potting and coatings.

Association of Consulting Chemists & Chemical Engineers, Inc., New York, N. Y., will observe its thirtieth annual meeting with a symposium on "What's New In Chemistry" at the Biltmore Hotel, New York, N. Y., October 28. Walter J. Murphy, editorial director of A.C.S. Applied Journals, and other prominent men will be guest speakers. The symposium will start at 3:00 p.m. and continue following reception and banquet. The detailed program will be published later.

Metro Rubber Products Corp., Morris, Ill., has purchased the assets of Blackhawk Rubber Products Co., Rockford, Ill. The manufacturing facilities have been moved to Morris, where they will be operated as the Blackhawk Rubber Co., a division of Metro Rubber Products Corp. The executive officers remain the same: namely Bert C. Oveson, president, and Robert M. Erickson, secretary.

The Goodyear Tire & Rubber Co., Akron, O., is adapting its several lines of premium tires to accommodate optional installation of Captive-Air Steel-Cord Safety Shields. The group of tires includes the new Double Eagle as well as Blue Streak and Nylon Custom Super Cushion, Captive-Air types. The shield is available in a full range of 14- and 15-inch sizes. Captive-Air shields, reports the company, are adaptable for use in more than one set of tires. A customer can use his shields in his next set of tires, in Suburbanite Winter tires, and, if the size is the same, in a set of tires on his next new car. Distribution is nationwide.

American Viscose Corp., New York, N. Y., a leading producer of rayon tire cord was recently a host to representatives of auto manufacturers who saw a demonstration of original-equipment tire stamina in Detroit Mich. In the demonstration, cars equipped with the same-type rayon cord tires now specified original equipment on about 99% of 1958 model cars, were put through such tire-punishing stunts as an 85-foot ramp-to-ramp leap, skid turns, and side-over driving on the sidewalls of two tires. The demonstration was arranged to show automotive personnel that original-equipment rayon cord tires can safely withstand far more punishment than the family-car tires encounter.

Pulverized Limestone Association at a meeting in Pittsburgh, Pa., on May 28 announced the availability of a permanent color standard in the 94% reflectance range. This standard plate for measuring high brightness pigments on existing equipment was developed by the Association's technical committee and is being made available for those interested in obtaining one. Inquiries should be addressed to W. Runge, Secretary of the Pulverized Limestone Association, Alabama Calcium Products Co., Gantts Quarry, Ala. Orders for these plates, which will cost approximately $60.00, should be forwarded to the secretary before September 1.

Minnesota Rubber Co.'s plastic and latex division, Minneapolis, Minn., in cooperation with the West Fargo Mfg. Co., has developed a revolutionary new fertilizer spout for fertilizer attachments on grain drills. Replacing the cast-aluminum spouts formerly used, these new spouts are made of a rigid polyvinyl chloride plastic material called rigid Min-O-Sol. This material, according to the company, which can be machined, tooled, or tapped, has high strength and rigidity with an exceptionally high impact rating plus the corrosion resistance required for highly corrosive materials such as commercial fertilizers.

Dow Corning Corp., Midland, Mich., has announced that Sylflex, its silicone treatment for leather, is being used as part of a radically new method of shoe construction, where shoes are molded to the silicone-treated upper leather. Sylflex is claimed to provide waterproofing without affecting the natural porosity of the leather. The new method involves a vulcanizing process and machinery developed by C. & J. Clarke, Ltd., Somerset, England. The process, said to make possible for the first time completely waterproof shoes, eliminates the seam between sole and upper, making it impossible for water to seep through this vital area. Upper seams, it is reported, are also sealed in a separate operation with a self-vulcanizing rubber to prevent leaks. The Dow Corning Sylflex treatment is applied in the tanning process and penetrates all through the leather. The U. S. Army Quartermaster Corps has announced that in the near future its combat boots would be made by the vulcanized process. Sports and outdoor shoes as well as youths' and children's shoes are considered naturals for this type of footwear.

B. F. Goodrich Industrial Products Co., Marietta, O., has manufactured tons of Koroseal polyvinyl chloride material to be used as tank lining in the world's largest aircraft plating plant when it goes into production in June at McClellan Air Force Base, Sacramento, Calif. The lining will protect plant equipment against corrosive plating solutions and fumes which attack metal.

Rubber Fabricators, Inc., Grantsville, Va., has been made an award on the 80-hour week textile set-aside portion of invitation for bids QM 36-243-58-674 by Military Clothing & Textile Supply Agency, Philadelphia Quartermaster Depot, U. S. Army, Philadelphia, Pa. The bid covers mattress, pneumatic, nylon, two sides coated with natural and/or synthetic rubber, inflated by mouth, O.G., QM shade 207, designed for use with sleeping bag 73¾ inches long, 31½ inches wide. The bid was for 95,170 mattresses, at $5.81 each, for a dollar value of $552,937.70. This procurement is for the U. S. Armed Services.

The Firestone Tire & Rubber Co., Akron, O., has created two new sales districts, one in Florida and the other in California, to handle increased business better. The new Florida district covers the southern part of the state from Vero Beach on the east coast to Fort Myers on the west coast. The other district is Los Angeles County. It was formerly part of the southern California district, which now comprises the area south of Bakersfield, excluding Los Angeles County.

Hooker Chemical Corp., Durez plastics Division, North Tonawanda, N. Y., recently placed important research and sales effort toward promoting its fire-resistant polyester resin, Hetron(R) in the manufacture of pleasure boats. Hetron is the first polyester resin inherently fire-retardant without using additives which cause some loss of other desirable qualities such as strength and finish. That this work is starting to bear fruit is now evidenced by the fact that Feather Craft, Inc., Atlanta, Ga., is currently introducing to the boating public "La Sirena," the first glass fiber-reinforced plastic outboard runabout to be fire-retardant, since Hetron is used for the hull and deck.

Union Carbide Corp., Silicones Division, New York, N. Y., during the past few years has been doing research in packaging as well as on silicone elastomer compounds in order to serve its customers better. As a result, a new square standard shipping box for all silicone rubber compounds made at the Long Reach, W. Va., plant has been adopted. The box is a flat fiberboard container which comes in two sizes: 16 by 16 by 3 inches and 16 by 16 by 6 inches. The smaller one is used to ship 25 pounds of compound, wrapped in polyethylene; the larger is used to ship 50 pounds in two 25-pound packages each wrapped in polyethylene. The new flat carton is said to have the following advantages: durability in shipping and storage; convenience in stacking; ease of handling; light weight —low package to content ratio; and protection of product.

Pittsburgh Coke & Chemical Co.'s industrial chemicals division, Pittsburgh, Pa., recently expanded its plasticizer production capacity by 50%. The decision to expand production at this time is based on the growing use of vinyl plastics in the U. S. economy and the company's basic position as a producer of phthalate plasticizers.

Appleton Machine Co. has opened a new Chicago sales office and show room under William Boas, recently a consultant to the packaging industry, who will represent the company in the Chicago area. Appleton Machine's newly acquired Doven line of specialty slitters and rewinders will be displayed in the show room at 2222 S. Michgan Ave., Chicago, Ill.

H. K. Porter Co., Inc., has announced that two of its divisions—Quaker Rubber and Leschen Wire Rope—have opened a joint sales and service branch office to serve West Virginia, eastern Ohio, and western Pennsylvania. Located at 450 Second St., New Kensington, Pa., it provides added office space and combined warehouse facilities for both divisions.

American Cyanamid Co., Bound Brook, N. J., has announced a price cut for its diphenylguanidine (DPG) accelerator, regular or dustless. The revised price per pound, for ton lots, is 49¢; for less-ton lots, 50¢. Prices are f.o.b. Warners, N. J., with minimum transportation allowed to destination. Prices west of Rocky Mountains are 2¢ per pound higher.

B. F. Goodrich Tire Co., Akron, O., has reported that size 6-70-15 was by far the most popular of the approximately 56,600,000 replacement passenger tires sold by the tire industry in 1957. The 6.70-15, which came as original equipment on Chevrolets, Fords and Plymouths produced through 1956, accounted for 42.8% of all replacement tires sold. The second and third most popular sizes were also 15-inch sizes, the company report revealed. Size 7.10-15 provided 19.3% of replacement sales; while the 7.60-15 accounted for 14.1%. The 6.00-16 was in fourth place in 1957, taking 5.7% of the market. The 7.50-14, now standard equipment on the three popular low-price cars, took 4.39% of replacement sales.

Bowen Engineering, Inc., North Branch, N. J., recently announced the acquisition of the business and assets of Instant Drying Corp., New York, N. Y., one of the oldest firms in the spray drying equipment field. Spray drying is estimated to have been a $6-million business in 1957 and to have the potential to more than double within the next few years as spray drying techniques are adopted more and more by food, ceramics, pharmaceutical, chemical, and other industries.

National Electronics Laboratories, subsidiary of Thiokol Chemical Corp., Trenton, N. J., has received an order for 200 special communication devices totaling more than half a million dollars. These devices are for the control of air ground communications at airports throughout Venezuela. It is expected that the initial shipment will be made the latter part of this year, with the order completed during 1959. It was reported that this is the first major export order of this nature.

Wyrough & Loser, Trenton, N. J., has announced the completion of new and fully operative facilities for the production of its Poly-Dispersions at Newtown in Bucks County, Pa. Advantages to users of the new facilities are: substantially reduced prices on Poly-Dispersions; generally prices are reduced about 20%; faster service; and special products, including custom blends, now can be made in any quantity. Quotations, laboratory samples, and a new price list are available from the company upon request.

News Briefs

Machinery & Supplies Co., Inc., 2000 Walnut St., Kansas City, Mo., has been appointed a distributor of the industrial rubber products of United States Rubber Co., New York, N. Y. The Kansas City firm will distribute conveyor belting, transmission belting, rod and sheet packing, all types of hose and other industrial products. The firm has been established for 20 years, and it serves contracting and industrial customers in Kansas City, western Missouri, and eastern Kansas.

Wellco-Ro-Search, Waynesville, N. C., held dedication ceremonies April 25 to inaugurate the formal opening of its new plant in Hazelwood, N. C. The 5,200-square-foot building will house the firm's machinery-building department for the production of vulcanizing presses and molds for "Process 82" footwear and other Ro-Search patented footwear manufacturing processes. The transfer of the machinery building department to the new site has enabled Wellco to expand its footwear manufacturing facilities.

Texas Butadiene & Chemical Co., Houston, Tex., has shipped more than 1,700 tons of butadiene aboard the Norwegian ship *Gasbras Sul* for shipment to the north German port of Emden. From there it will be transported by tank cars to Marl Recklinghausen, Germany, location of the Chemische Werke Huls plant. This shipment is one of three of butadiene which will be moved to the Germany company for feedstock to its recently completed synthetic rubber plant. Huls will be self-sufficient in butadiene when its own plant comes onstream later this year. The *Gasbras Sul,* which normally transports butane and propane, is equipped with 30 pressure tanks ranging in size from 13,000 to 30,000 gallons each.

The Firestone Tire & Rubber Co., Akron, O., has announced that its Fabritank the first collapsible rubber storage tank made to withstand cold weather on Far North oil drilling operations, is now in test service in northern Canada. The Fabritank was made to meet rigid specifications for conditions not encountered in less rigorous climates where collapsible tanks are now in use. Known in the oil fields as the "Whale," the tank is expected to help solve the oil industry's tough problem of transporting storage tanks in cold climates. Oil officials who are testing the new tank say that it has passed all tests. Manufactured of extremely durable synthetic rubber-coated nylon fabric, the tank can be rolled up and transported in a wooden crate. It has a capacity of 6,122 gallons. Similar tanks have been used in the Southwestern United States.

[1] See Rubber World, Apr., 1958, p. 126.

Tennessee Eastman Co., Kingsport, Tenn., has ceramic containers, more than five feet in diameter and seven feet in height, of which some 500 will find their way into the possession of buyers who have recognized their value in the batch manufacture of pharmaceuticals, chemicals and plastics. The jars have been replaced at Eastman as a result of a change in process; but they are expected to prove useful and rewarding to manufacturers or processors whose operations require highly corrosive-resistant containers with capacity up to 740 gallons. The ceramic containers are said to be in excellent condition, having a top opening of 29.5 inches in diameter and a three-inch side opening which can be tapped with a valve to draw off the materials. Including the 48-inch high, 10-gage steel liners in which the containers are set, the weight of each container is 4,000 pounds. Wall thickness of 1⅝ inches and bottom thickness of 2¼ inches insure that the containers can take rugged use.

The Firestone Tire & Rubber Co., Akron, O., has completed tests at its farm equipment proving grounds at Columbiana, O., which have revealed that use of its new rubber compound, Rubber-X, has increased the tread life and body strength in its new All-Traction tractor tire. The extra body strength is attributed also to an increase in the number of cords per square inch. The increase in cord count, coupled with stronger rayon, makes the All-Traction 10 to 30% stronger than other rayon tires with a similar rating, it was claimed.

Thiokol Chemical Corp., Trenton, N. J., has been awarded by the Department of Army a research and development contract for work on the Army's Nike Hercules booster engine. The Nike Hercules, whose sustainer is also a Thiokol solid propellant engine, is the nation's second land-based combat ready surface-to-air missile system to be placed by the Army into the Air Defense System of the United States.

The Firestone Tire & Rubber Co., Akron, O., revealed that the tires used in the 500-mile Memorial Day race ran cooler than ever before in speedway history. Post-race tests and research showed that the cooler-running tires made them the safest ever developed for racing. The firm's engineers said tires were clinging better to the track surface because of improved tread compounding. A new tread rubber, called Rubber X commercially, is credited with the improved traction.

Pennsalt Chemicals Corp., Philadelphia, Pa., will move the sales department and research and development activities of its corrosion engineering department to the Natrona, Pa., plant in September in anticipation of increased production and sales of its corrosion-resistant products for the construction and industrial maintenance markets. Manufacturing, sales, and development activities will all be centered in Natrona under the direction of Robert R. Pierce, currently manager of the corrosion engineering department and veteran of 16 years of plant, technical service, and sales management with Pennsalt.

NEWS about PEOPLE

R. P. Dinsmore, vice president in charge of research and development for The Goodyear Tire & Rubber Co., Akron, O., and **A. L. Freedlander,** chairman of the board of The Dayton Rubber Co., Dayton, O., were two of a hundred distinguished people who received special citations during the dedication of the new Dana Science Building, June 14, at Indiana Technical College, Fort Wayne, Ind. The recipients were selected on the basis of their outstanding contributions to industrial development through management, science, and engineering. Selection was made from a list of approximately 600 outstanding nominees in Ohio, Indiana, Kentucky, Michigan, and Illinois.

Bruce B. Gralow has been elected a director of Phillips Electrical Co., Ltd., Brockville, Ont., Canada. He is a vice president of the Ontario Paper Co., Ltd., Thorold, Ont., and of Quebec North Shore Paper Co. and is also a vice president and director of Canadian British Aluminum Co., Ltd., and of Manicouagan Power Co.

Zito Studios

Joseph P. Fuller

Joseph P. Fuller has been named assistant manager of the eastern district of the elastomer chemicals department, E. I. du Pont de Nemours & Co., Inc., with headquarters at Trenton, N. J. Fuller, who joined Du Pont in 1946, has been a sales representative in the eastern district office since 1947, specializing in sales to the wire and cable industry. Prior to that he had been a rubber chemist, assigned to Du Pont's rubber laboratory.

Frank W. Fox, pioneer in putting farm tractors and machinery on rubber tires a quarter-century ago, retired on May 31, after 44 years' service with the Goodyear Tire & Rubber Co., Akron, O. Affiliated with the Goodyear truck tire sales division, he was with the company since 1914. He was graduated from Western Reserve University, Cleveland, O. In 1931, he was given the task of demonstrating the first set of pneumatic farm tires made by Goodyear and spent much of the next 18 months in southern states proving the practicability of putting farm machinery on tires in a series of actual field tests—many of them conducted in Florida citrus groves. When the tempo of heavy construction was stepped up in the later depression years of the 30's, Fox was transferred to the field of off-the-road tires and worked with contractors and equipment manufacturers in seeing to it that the mechanical earthmoving giants had tires big and strong enough to push and haul bigger and bigger loads.

Clement H. Horst, assistant vice president since 1957, has been appointed vice president and general manager of the International Division of Heyden Newport Chemical Corp., New York, N. Y. He succeeds **Ernest E. Holdman,** who retired June 30. Horst began his career with the company in 1935.

John M. Gyenge has been advanced to the position of sales development engineer for The General Tire & Rubber Co., Akron, O., and will report to Norman Phillips, manager of sales development. Since joining General Tire in 1956, Gyenge has served as a rubber technical service representative.

Jack D. Porter has been appointed manager of fleet sales; while **George G. Hancock** succeeds him as manager of national account sales in organizational changes involving the truck tire sales department of The Goodyear Tire & Rubber Co., Akron, O.

C. Eugene Cain has been made assistant technical director of Alco Oil & Chemical Corp., Philadelphia, Pa. He started with Alco in 1952 as head of the sales service laboratory and was transferred to the planning and engineering group in January, 1957. Prior to joining Alco, he acquired extensive experience in the manufacture of synthetic rubber latex at the Firestone Tire & Rubber Co. and of latex foam products at Toyad Corp.

Paul A. Hiznay has been transferred to the Philadelphia, Pa., district; **Francis R. Kean,** to the Newark, N. J., district; and **Charles D. Schmidt** to the Detroit, Mich., district as sales representatives for Union Carbide Chemicals Co., division of Union Carbide Corp., New York, N. Y.

Robert L. Miller has been appointed eastern sales manager of RUBBER WORLD, New York, N. Y. He joined the sales staff of the publication in May, 1957, as eastern sales representative. His territory will be east of Buffalo, N. Y., including New England, and as far south as Charleston, W. Va.

Robert L. Miller

J. Justin Basch has been appointed to the new position of marketing vice president of Oakite Products, Inc., New York, N. Y., now in its fiftieth year as a manufacturer of industrial cleaning and metal treating materials. Basch, formerly vice president for research and product development, will now be responsible for sales, engineering, advertising, and marketing research as well.

Frank G. Pearce has been named director of project engineering for Amoco Chemicals Corp., Chicago, Ill. Dr. Pearce will supervise engineering development of new projects, including raw material availability and process economics, and will be responsible for determining the technical soundness of projects before construction. Prior to joining Amoco, he spent 11 years with Pan American Petroleum Corp., Tulsa, Okla., where he was supervisor of the process design section of the research department.

H. Wilfred Lynch has been appointed vice president in charge of sales and new product development at Moxness Products, Inc., Racine, Wis. He was also elected to the board of directors. In addition to supervision of sales and promotional activities on electrical insulation products, he will head firm's new product development department which specializes in silicone and fluorocarbon rubber products.

Francis C. Thompson has joined Marbon Chemical of Gary, Ind., a division of Borg-Warner Corp., as a technical sales representative for the Indiana and western Michigan area. He came to Marbon from Woodall Industries where he had served as a salesman of interior trim to the automotive industry.

Francis C. Thompson

A. G. Lund

A. G. Lund has been appointed general manager of the 90,000-acre Firestone Plantations Co. in Liberia. He will be in charge of all Firestone operations in the West African Republic. He succeeds **Ross E. Wilson,** who retires July 1. Lund joined the Firestone Tire & Rubber Co., Akron, O. in 1942. In 1955 he was appointed comptroller of the Firestone Plantations and took up residence in Liberia.

Raymond C. Firestone, president of the Firestone Tire & Rubber Co., Akron, O., has been elected vice president of the National Committee on Boys & Girls Club Work. The committee is a non-profit organization cooperating with State and Federal Extension Service in furthering 4-H Club Work. Long active in rural youth programs, Mr. Firestone has been a director of the committee since 1952, and the company which he heads has supported the 4-H Soil and Water Conservation program for the past 15 years.

Hans Jorg Wartmann and **Roy E. Stack** have joined Columbia-Southern Chemical Corp.'s Barberton, O., research laboratory as research chemist and chemist, respectively. Also, **Robert R. Meltz** has been assigned to the rubber laboratory as senior compounding chemist.

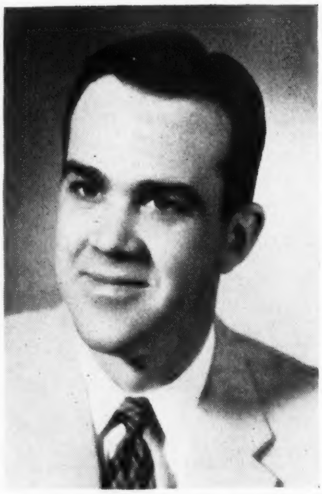
Myron S. Gelbach, Jr., has been elected vice president of Alco Oil & Chemical Corp., Philadelphia, Pa. He has been associated with Alco for two years.

William C. Zekan, associated with A. Schulman, Inc., Akron, O., for 21 years, has been appointed executive vice president of the firm. Also **Dudley G. Brattin** has been given the post of treasurer and comptroller of the company. Zekan, at the age of 36, was named vice president and director of the company, and has spent some time in Schulman's New York offices. Brattin, starting in the accounting department, was advanced to assistant comptroller and assistant treasurer, prior to his recent promotion.

William C. Zekan

Dudley G. Brattin

Gene F. Krcmar, Norbert L. Kuchenmeister, and **Donald Joe McDonald** have been named shift foremen at the general chemicals plant of B. F. Goodrich Chemical Co., Henry, Ill. Krcmar joined the company as a junior technical man at its Avon Lake, O., development center, working on process development. Kuchenmeister, who started with Goodrich in June, 1956, at the Avon Lake general chemicals plant, has worked as a shift foreman in several production areas. McDonald moves to his new assignment from the company's Calvert City, Ky., plant.



Wayne Benson

Wayne Benson, who formerly was in charge of production control at Bridgwater Machine Co.'s Athens, O., plant, and who, for the past three years, has been general manager of Bridgwater's Brantford, Ont., Canada, plant, has been made sales manager of the company's tire mold division, Akron, O. He succeeds **W. M. Mapes,** recently deceased vice president and sales manager. Benson will be assisted by **Elton Coleman,** who has been associated with tire mold division for many years.

Anthony DePhillips has been appointed assistant branch manager of the Philadelphia, Pa., branch sales office of Diamond Alkali Co., Cleveland, O., to succeed the late **George J. Soren.**

Harold B. Lawson has been elected assistant secretary and assistant treasurer of United Carbon Co., Charleston, W. Va., at a recent meeting of the company's board of directors. Widely experienced in financial activities, he joined United Carbon in February as controller, a post he will continue to hold. He was formerly treasurer of The Dobeckmun Co. and earlier had been controller of the industrial products division of Firestone Tire & Rubber Co., Akron, O.

Leo A. Goldblatt and **Gordon S. Fisher** recently received the Superior Service Award from the United States Department of Agriculture for work which they did as members of the Southern Utilization Research & Development Division of the Agricultural Research Service. More than 750,000 tons of cold rubber, valued at more than $350 million, a high-quality synthetic, is produced annually employing paramenthane hydroperoxide as a catalyst through the process developed by Dr. Goldblatt and Mr. Fisher, for which they received a joint award.

Homer H. Hazelton

Homer H. Hazelton has been named Pacific Northwest representative for Richardson Scale Co., at the western regional office, San Francisco, Calif. The northwest territory will consist of the states of Oregon, Washington, and Idaho. Hazelton has had considerable sales and service experience, having served in these capacities at both the Wichita and Chicago branch offices since he started with Richardson in 1948.

Herbert S. Parham, an assistant director of sales, is now a director of sales for the organic chemicals division, Monsanto Chemical Co., St. Louis, Mo., filling a vacancy created by the appointment of **William M. Russell** as assistant general manager of Monsanto's overseas division. **J. Paul Ekberg, Jr.,** district sales manager, Los Angeles, Calif., has been named an asistant director of sales, succeeding Parham. He will return to St. Louis for the assignment. **Armin L. Klemm,** manager of personnel and training for the division's sales department, has been appointed district sales manager at Los Angeles, succeeding Ekberg.

A. L. Back recently opened a consulting service under the name A. L. Back & Associates, R.D. 2, West Chester, Pa. The new firm specializes in latex, rubber, engineering, and statistical quality control problems. Mr. Back, with more than 18 years' varied experience in latex, rubber, and polymers, is associated with experts in related fields. Previously he had been chief chemist with a latex foam manufacturer.

Arthur H. Phillips has been appointed general counsel and secretary of Godfrey L. Cabot, Inc., and subsidiary companies, producers of carbon black and chemicals, with headquarters in Boston, Mass., effective June 1. He succeeds **Fred C. Fernald,** who has retired as vice president, general counsel, and secretary of the organization. Fernald will continue his association with Cabot as a member of the board of directors and as legal advisor and will retain offices in Boston.

Fabian Bachrach

Arthur H. Phillips

Lubitsh & Bungarz

S. Robinson Foster

S. Robinson Foster has been named technical sales representative in the elastomer chemicals department's Akron, O., district sales office for E. I. du Pont de Nemours & Co., Inc. He will work with customers in eastern Ohio, western Pennsylvania, and in parts of Maryland, West Virginia, and New York. He joined Du Pont in 1951 as an engineer at the Yerkes cellophane plant in Buffalo, N. Y. In May, 1956, he became technical representative in the elastomers laboratory at Chestnut Run near Wilmington, Del., a position he held until his recent move to Akron.

Victor E. Buehrle, Jr.

Victor E. Buehrle, Jr., has joined the sales staff of Columbian Carbon Co., in its Akron, O., office. He comes to Columbian from previous connections with The B. F. Goodrich Co. and The General Tire & Rubber Co.

Robert W. Little has received one of three new appointments in the rubber chemicals division of Hercules Powder Co.'s paper makers chemical department, Wilmington, Del. He has been named assistant sales manager with headquarters in Wilmington. **David I. Johnson** has been named manager of the department's Akron, O., sales office, and **Robert W. Turner** becomes sales representative at the Akron office. Mr. Little, for the past four years manager of the rubber chemicals division's Akron sales office, has been succeeded by Johnson. Turner joined Hercules in 1951.

George R. Thurman has been named director of the Monterey, Calif., engineering laboratory of the guided missile division of The Firestone Tire & Rubber Co., Akron, O. Dr. Thurman, formerly manager of the Firestone defense research division in Akron, succeeds Capt. **Frank W. MacDonald** (USN ret.). **V. E. Lucas,** assistant manager of the defense research division, succeeds Thurman as manager of that division.

Karl L. Rohde, Jr., has been assigned as sales representative for organic chemicals in southern California for Dewey & Almy Chemical Co., Division of W. R. Grace & Co. Rohde, whose headquarters will be in Los Angeles, will serve customers in the paint, paper, adhesive, textile, and plastics fields. The firm manufacturers vinyl acetate polymers and copolymers, styrene-butadiene copolymer latices, plasticizers, and dispersing agents.

Ray McCurdy

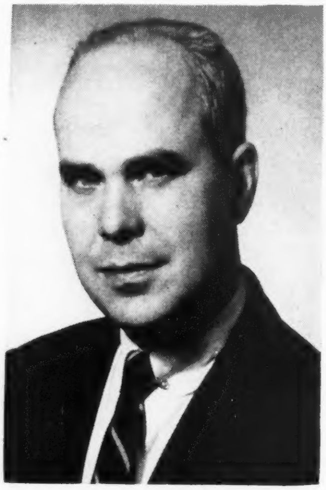
Ray McCurdy has been appointed a technical sales representative for Marbon Chemical of Gary, Ind., a division of Borg-Warner Corp. His territory will be southern Ohio, Kentucky, Tennessee, Georgia, Alabama, and Florida.

Eugene J. Sullivan, who started as a glue salesman 12 years ago, assumed the duties of executive vice president of Borden Chemical Co., New York, N. Y., on July 1. Sullivan, vice president in charge of sales of the company since January 1, 1957, succeeds **H. H. Clarke,** who recently left Borden to become president of Dyna-Therm Chemical Corp., Culver City, Calif.

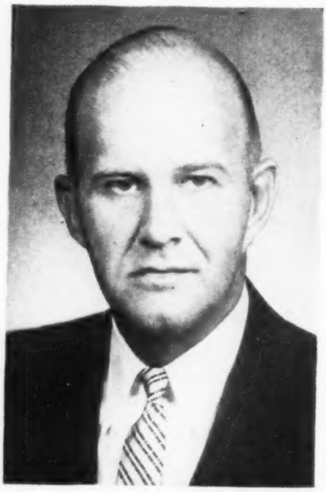
George Myers has joined the sales staff of Thiokol Chemical Corp., Trenton, N. J., as technical representative in the polyurethane sales group. He was formerly employed as sales engineer for Kelite Corp., Berkeley Heights, N. J., a manufacturer of metal cleaning and degreasing chemicals. Previously he had been a sales representative with the Sherwin-Williams Co., Philadelphia, Pa. Thiokol's Rigithane foam is being developed for use in thermal insulation, packaging, and sound deadening. Its Solithane resin is designed for casting, electrical potting, protective coatings and related applications.

Stanley Bennett, general sales manager, has been elected a director of the Beebe Rubber Co., Nashua, N. H. Other directors include: **E. Colman Beebe,** president and treasurer; **Charles C. Beebe,** vice president; **Mrs. Janet Beebe** assistant clerk; **Mrs. Edna Mitchell,** clerk and assistant treasurer; and **G. Kenneth Eaton.** Mr. Bennett joined the company in June, 1956. Previously he had been vice president in charge of sales for Compo Shoe Machinery Corp., Boston, Mass.

Tom J. Norman, sales representative in the western division, has been named manager of national accounts and government sales for The Firestone Tire & Rubber Co., Akron, O. He succeeds **R. V. Short,** who was advanced to manager of the company's Richmond, Va., sales district. Norman assumes responsibility for sales of new tires and tubes, retreads, batteries, and spark plugs at the national account and government levels.



Eugene J. Sullivan



B. J. Skowronski

B. J. Skowronski has joined the technical service department of Neville Chemical Co., Pittsburgh, Pa. He comes to Neville after having served as a rubber and plastics technical service supervisor for the SDC division, Diamond Alkali Co., and his experience also includes tire compounding development with Armstrong Rubber Co. and SBR production supervision with Naugatuck Chemical Division, United States Rubber Co.

W. T. Davis

A. W. Swartz, Jr., and **W. T. Davis** have been elected to the posts of executive vice president and vice president in charge of manufacturing, respectively, by the board of directors of Linear Inc., Philadelphia, Pa., manufacturer of mechanical packings. Davis, formerly a vice president of Sun Rubber Co., joined Linear in 1956 when the company moved the manufacturing phase of its business to Dallas, Pa. Mr. Swartz, Jr., has been with the company for 20 years and had been vice president in charge of operations for the last eight years.

Herman R. Thies, general manager of The Goodyear Tire & Rubber Co.'s chemical division, Akron, O., received an honorary doctor of science degree from his alma mater, Phillips University, Enid, Okla., during the University's golden anniversary commencement service on May 28. During his career with Goodyear, Thies has made many valuable contributions to rubber chemistry, has been assigned a number of patents, and has written scientific papers for publication. He joined the company in 1920 as a rubber research compounder and in 1936 became assistant director of research. He was appointed manager of Pliolite sales in 1943 and two years later was named to head up the plastics and coatings division. When the Goodyear chemical division was organized in 1948, Thies was appointed manager, and in January, 1954, he became general manager. In this capacity, he directs all phases of activity concerning the various products manufactured and sold by the division.

Max Levine has been appointed group leader in organic research at Industrial Rayon Corp., Cleveland, O. Dr. Levine joined Industrial Rayon as a research chemist in 1952.

Henry E. Pruner has been appointed marketing manager of the mechanical goods division of United States Rubber Co., New York, N. Y. He was formerly western regional sales manager and manager of conveyor and elevator belting sales. He will now supervise product sales management of conveyor belting, hose, packing tape, matting and expansion joints, and all mechanical goods products sold through branches and the government sales organization.

J. E. McAuliffe has been elected chairman of the board, and **J. W. Kerr** president of Triangle Conduit & Cable (Canada), Ltd., Toronto, Ont., Canada. McAuliffe is the founder of the company and immediate past president. Kerr was formerly vice president and general manager.

Arthur G. Pinard has been appointed manager of industrial products department, and **Edward A. Clout** supervisor of calendered materials division, Canadian Resins & Chemicals, Ltd. Pinard, sales supervisor for resin and chemical products since October, 1956, was assistant to the manager, industrial products division, for two years previously. Clout, joining the firm in 1952, for the past year and a half has held the position of sales supervisor, granular products.

C. C. Brumbaugh, director of engineering since June, 1954, has been appointed a vice president of Diamond Alkali Co., Cleveland, O., following action by the board of directors. In his new post, his new sphere of influence will be the engineering, research, and related technical aspects of Diamond's business. Named to succeed Brumbaugh as director of engineering is **Robert C. Sutter,** operations manager of the company's chlorinated products division for the past year and a half.

Arthur E. Brooks will now direct all research on materials for the research and development department, United States Rubber Co., Wayne, N. J.; **T. J. Rhodes** will head up all engineering research; and **D. Lorin Schoene** will direct liaison between the research and development department and the manufacturing divisions. Dr. Brooks was named manager of the company's new research center in Wayne, N. J., when it opened last year. Rhodes since 1953 has been manager of the mechanical engineering research department. Dr. Schoene was formerly director of research and development for the rubber company's Naugatuck Chemical Division.

Kenton Cravens, president of Mercantile Trust Bank of St. Louis, Mo., and chairman of the board of The Eagle Rubber Co., Ashland, O.; **Richard Long,** president of Eagle and also of the Ashland Chamber of Commerce; **T. W. Miller, Jr.,** president of The Faultless Rubber Co., Ashland; and **Harry Gill, Jr.,** president of National Latex, Inc., Ashland, were participants in a business-education day program, April 25, in Ashland, to educate teachers on business principles and aims. All 18 Ashland industries involved in the program plan to pool their talents and efforts and are evaluating new approaches to the business education of teachers of the community.

Obituaries

Jesse S. Wainright

Jesse Stiles Wainright, a vice president and a member of the board of directors of The Mansfield Tire & Rubber Co., Mansfield, O., passed away on June 1 in Boston, Mass. Death resulted from complications following surgery on May 26.

Mr. Wainright lived in Sea Girt, N. J., after leaving Mansfield upon entering retirement several years ago.

He was widely known through more than 35 years of activity with Mansfield Tire in various sales capacities including district sales manager, general sales manager, vice president, and director.

Prior to having joined the Mansfield Tire organization he had been engaged in the automotive business in Newark, N. J., and prior to that had been head buyer for Butler Brothers, New York, N. Y.

He was born December 29, 1880, at Manasquan, N. J. The deceased is survived by his son and three grandchildren.

Services were conducted in Mansfield on June 4.

Edward T. Day

Funeral services for Edward T. Day, 51, former sales manager of the mechanical goods division, United States Rubber Co., New York, N. Y., who died June 17, were held at the Larkin Mortuary, Salt Lake City, Utah, on June 20. Mr. Day was en route to Salt Lake City by plane from Denver to join his wife when he suffered a heart attack, about 30 minutes from the scheduled stopover.

Mr. Day joined the company in 1934 as a mechanical goods district manager for the Salt Lake City branch. Six years later he took over the same duties for the larger Los Angeles, Calif., branch. In 1953 he was named national manager of branch sales for the mechanical goods division, after a year as assistant manager.

He is survived by his wife, a brother, and his mother.

John V. Muller

John Valentine Muller, 54, service division manager of the traffic department of United States Rubber Co., New York, N. Y., passed away unexpectedly on June 7.

Mr. Muller had been a member of the company's general traffic department for 41 years. He served as passenger agent and clerk. Then in 1940 he became assistant manager of the operation division and in 1945 was appointed section manager. He was named manager of the service division for the department in 1951.

Mr. Muller was a native of New York, N. Y.

He is survived by his wife, two sisters, and two brothers.

Funeral services were held June 10 in the Earl A. Towers Funeral Home, Oceanside, N. Y.

Guy F. Lipscomb, Sr.

Guy Fleming Lipscomb, Sr., 74, passed away June 8 in Columbia S. C. after an illness of several months. He was president of Continental Chemical Co., Cayce, S. C., vice president of Continental Tapes, and retired Dean of Chemistry at the University of South Carolina, Columbia.

Dr. Lipscomb graduated in mining engineering at Auburn in the Class of 1907, received his B. S. in chemistry in 1908 and his Ph.D. at Princeton University in 1916.

In his years of chemistry, Dr. Lipscomb gained the reputation of an outstanding educator, devoting 39 years to helping educate the younger generation. He is listed in the encyclopedia "American Men of Science."

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Pakistan

The General Boot House, Elphinstone St., Karachi, has announced that it has received permission from the Pakistan Government to produce 60,000 pairs of rubber and canvas shoes monthly in its Pak General Boot Factory, Karachi. This establishment, claimed to be the second largest factory in Pakistan, has been equipped with complete modern, imported plant, and the company is now anxious to obtain offers from American suppliers of chemicals and raw materials suitable for its purpose.

NEWS from ABROAD

Malaya

No Price Agreements

The stand Malaya would take on the question of price stabilization at the fourteenth meeting of the International Rubber Study Group in Hamburg, Germany, was ventilated in the local press in early June, and it soon became clear that an international agreement for rubber on the same lines as the International Tin Agreement would not be favored. At the meeting held last year at Jogyakarta, Java, Malaya rejected a proposal for an international agreement put forward by the French delegation.

Just before flying to Hamburg to attend the meeting, P. F. Adams, an official of the Ministry of Commerce & Industry, who headed the Federation delegation this year, said that Malaya would be willing to consider any scheme for price stabilization if it was practical from Malaya's point of view. Local rubber dealers immediately reacted and warned against any attempt to raise the price of natural rubber above that of synthetic.

Incidentally, the attitude of the Rubber Growers' Association on possible price stabilization proposals is unmistakably reflected in the adverse remarks on the subject made by the retiring chairman at the Association's meeting in London on May 9; he also took the occasion to give his opinion on the Rubber Study Group Conferences, which may be briefly and fairly paraphrased as: a waste of money and time which the governments involved would do well to stop.

Technological Research

How to combat synthetic rubber is, of course, the topic of the times here. While opinion is generally in favor of achieving this end by increased production to cut costs, there is a growing realization of the need also of research to improve the technological quality of natural rubber, which, however, has as yet not been translated into the kind of action the more ardent advocates of this kind of work would like to see.

The Straits Times, especially of late, has criticized the tardiness of the industry in this respect. In a recent editorial the industry was reminded of the warning issued four years ago by C. E. T. Mann, then director of the Rubber Research Institute, that without serious effort to improve the quality of natural rubber "beyond all recognition," there was little hope "of large quantities of natural rubber being used in the future." The point was made that despite falling prices for natural rubber, synthetic continued to gain ground, and not because it was cheaper, but because it was better for many purposes and was getting better all the time. This problem should be the basic one of research at the Rubber Research Institute for which, however, the efforts of the chemist and not of the botanist were needed.

In this connection the editorial went on to recall that three years had passed since disagreements between the experts and a section of the industry had led to the resignation in Malaya and England of experts who then joined laboratories of the synthetic rubber and plastics industries; a new research program had been promised, with full coordination of work under a controller of research, but the staff was depleted, and, as the authorities themselves had to admit, it would be difficult to recruit the investigators with the necessary qualifications.

RGA on Research and Other Matters

The speech made by E. D. Shearn, retiring chairman of the Rubber Growers' Association at the general meeting held in May, included what was in effect a reply to some of the above criticisms. Mr. Shearn made it clear that the organization was not against research, but against wasting money on work based on the "outmoded mandate" for research given 24 years ago when new applications and propaganda for the extended use of rubber were prime considerations. Today the chief problem is shortage of supplies at prices competitive with synthetic rubber, and the chief aim, lowering cost of production. But he added, the RGA recognized that soon this might not be enough, and in accordance with the recommendations of the Blackburn Committee (which, he underlined, was appointed as a result of suggestions made by the RGA) steps to direct research to the solution of the technical problems of natural rubber were now under consideration.

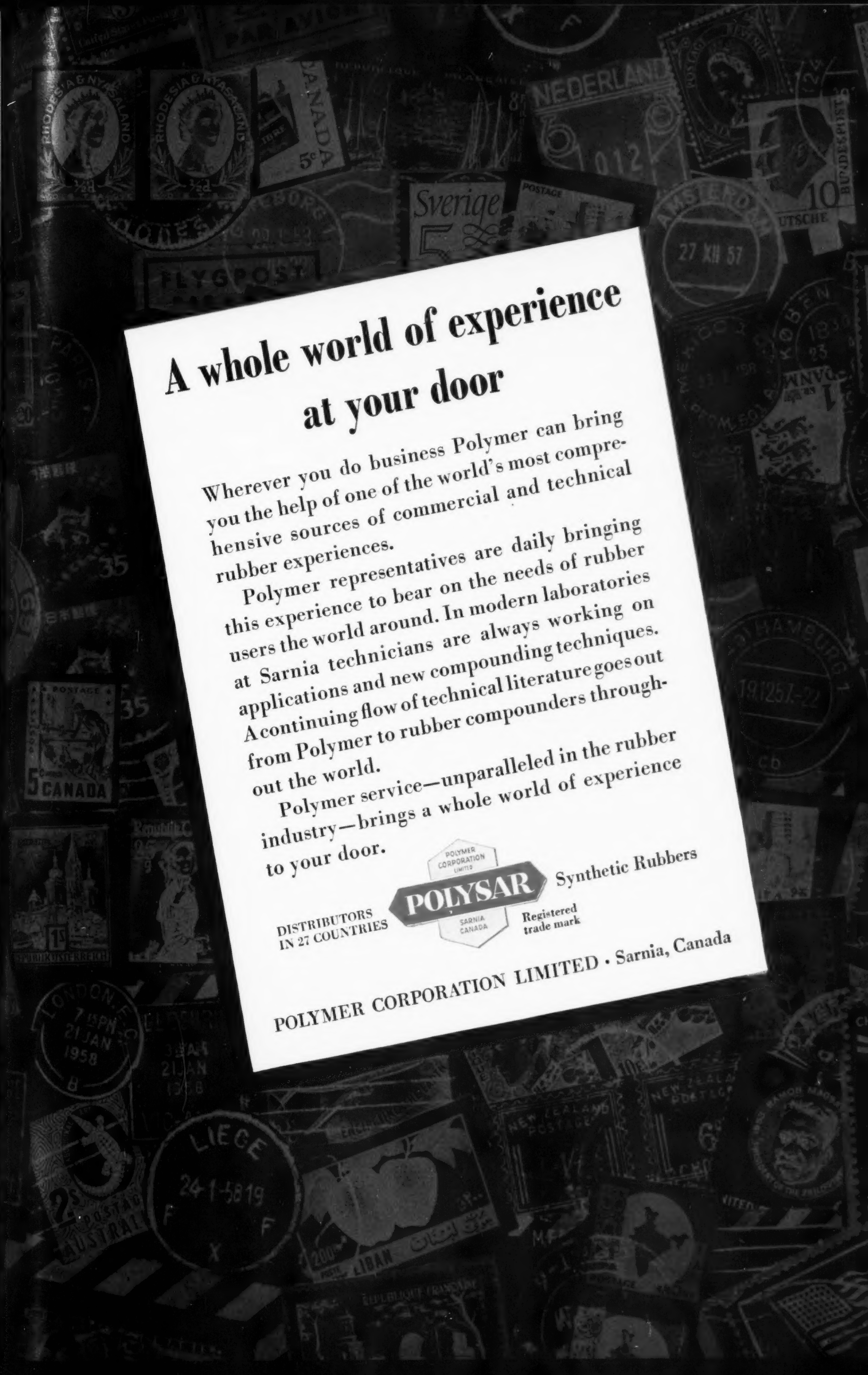
Mr. Shearn had begun his review of events in 1957 by stating that at present natural and synthetic rubber were complementary rather than purely competitive, but that the natural rubber industry must be prepared for the day when synthetic rubber became highly competitive, and the two industries were no longer complementary. He cited the downward trend in the percentages of natural rubber used out of total consumption of new rubber, which had declined steadily in the years 1955, 1956, and 1957 from 62½ to 58½ and finally to 56½%, and he impressed upon the meeting that the utmost efficiency on estates was imperative to combat synthetic.

He further stated that during 1957 more than 100,000 acres were newly planted or replanted with high-yielding rubber on estates in Malaya and more than 50,000 acres on smallholdings. During the period 1946-1957 inclusive, the totals had been approximately 660,000 acres on estates and 260,000 acres on smallholdings. He was at pains to explain that while these figures reflected the considerable influence of the government replanting scheme introduced in 1955, it was "entirely fallacious to describe as subsidies the payments by government to owners who replant" since the increased export duty purposely levied to cover these payments had not only financed the scheme, but had also provided the government with additional revenue.

Holding Companies For Estates Favored

The advantages of the creation of large holding companies within the rubber industry were explained to shareholders of Highlands & Lowlands Para Rubber Co., by the chairman, T. B. Barlow, in connection with plans which would require the authorized capital to be raised from £600,000 to £1,000,000. The company which at present owns 14,000 acres in Selangor under rubber and oil-palms, wishes to extend its activities.

Mr. Barlow said that the big City of London institutional and professional investors will not invest in small companies, and the Malayan rubber industry includes scores of such companies. Yet City investors are very much interested in the import and export trade of Malaya, which in 1957 amounted to £161,000,000, and therefore should support the planting community by taking a far greater share of its capital. Such action would be a safeguard against political insecurity and would also provide support to Malayan import and export trade.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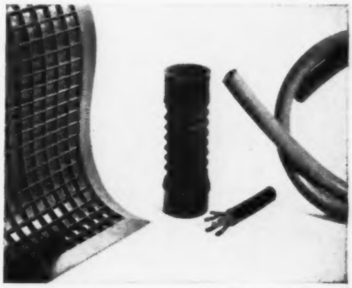

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Whatever the end products—light-colored synthetic-natural combinations, conveyor belts, auto floor mats, refrigerator door gaskets, industrial and garden hose, sink stoppers—Sunoco Rubber-Process Aids improve processibility, improve physicals, save you money consistently.

IF YOU PROCESS	USE	BECAUSE
Light-colored oil-extended polymers (1703, 1708, etc.)	CIRCOSOL® NS	It combines superior nonstaining characteristics with best processibility, imparts good physicals. Primarily an extender.
Oil-extended polymers (1703, 1708, etc.)	CIRCOSOL 2XH	It's a general-purpose softener and extender for light-colored rubber goods, especially where optimum physicals are required.
Regular neoprenes, natural rubber, Hypalon (where color is a problem)	CIRCO® LIGHT	It's an ideal all-around moderate-priced plasticizer for nonstaining reclaims and butyl inner tubes, SBR, GN, W, WRT.
Oil-extended polymers (1705, 1710, etc.) and natural rubber, Hypalon (where color is no problem)	SUNDEX® 53	It's a double-distilled aromatic plasticizer for tire-tread stock, rubber footwear, matting, toys, semi-hard rubbers, high-Mooney WHV.
Black master-batch polymers 1706, 1711, 1712, etc.	SUNDEX 1585	It's a new highly aromatic plasticizer for tough polymers where easy processing is desired. This is a distilled process aid.
Natural rubber, SBR polymers, regular and WHV neoprenes, acrylonitrile polymers	SUNDEX 85	It's especially recommended for very high loadings of WHV neoprene (from 75 to over 100 parts Sundex 85 to 100 parts polymer). Used in hard rubber goods.

For further information and a list of Sun offices, consult Chemical Materials Catalog or Rubber Red Book.

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The nominal issued capital of Malayan estates amounts to little more than £53,000,000, a small sum in comparison with the investing capacity of the City and the trade at stake, he went on. These facts are being realized in certain influential quarters, and suggestions have been made that in this era of large companies the process of association and grouping should be extended to the plantation industry by the creation of large holding companies, which would permit the existing operating units to be maintained with their efficient organizations and at the same time make them far more attractive to investing institutions.

It was in order to prepare the way for the beginning of such association that the stockholders of Highlands & Lowlands were asked to increase the authorized capital of the company.

Mr. Barlow then discussed the question of the sale of European-owned estates in the last two years. Almost 200,000 acres had been disposed of, he said, much of which had been fragmented, a procedure which might well lead to the discontinuance of the social and other services formerly provided by the large estates, such as water and electricity supplies, drainage, sanitation, medical and educational facilities, maternity benefits, etc.

Sir Eric Macfadyen, chairman of the Rubber Plantations Investment Trust, recently said that about one-tenth of the area of European-owned rubber in Malaya had passed into Asian ownership during the last four years.

Wage Dispute Continues

The negotiations on wages for plantation workers, broken off by the employers following several unofficial 12-hour strikes by tappers, were resumed when the Minister of Labor & Social Welfare intervened and suggested a compromise. New meetings thereupon took place, when it was attempted to come to an agreement on an interim settlement, without result so far, although it is thought that a sliding wage scale based on the monthly average price of rubber may eventually be worked out.

Fear Overproduction

The possibility that the recession in America might rapidly lead to reduction in demand for rubber throughout the world was put forward by the acting chairman of Malayan Rubber Producers, Ltd., J. G. M. Ferguson, at the company's May meeting. He warned that the law of supply and demand still works, and that with a lot of young, high-yielding rubber soon to mature, prudence required a close watch on the situation. Malayan producers must also curb excessive production in good time, before there is a total lack of demand, he advised. The replacement of rubber by plastics in many articles of daily use, he also cited as an adverse factor. The company's profits dropped steeply from $314,395 (Straits) in 1956 to $181,439 in 1957.

Rubber dealers in Kuala Lumpur pounced on Mr. Ferguson's statements and retorted that, on the contrary, Malaya should produce as much rubber as possible to make sure that it could be sold at a price that would "put synthetic out of business."

Nor did the Rubber Producers' Council, according to a spokesman, see any danger, so long as natural rubber "is sold at a profitable price and below that of synthetic."

Industry in Malaya

The agitation by the Malayan Rubber Goods Manufacturers' Association against the establishment of foreign manufacturers in Malaya apparently continues unabated. According to the latest news, the president of the association, Shum Kwai Hong, wrote to the Minister of Commerce & Industry, Tan Siew Sin, urging the government to pass legislation to prevent foreign capital from dominating the country's economy as otherwise "the people of Malaya might find themselves economic slaves in their own house." Foreign investment meant that profits would go out of the country; whereas profits on local investment would stay and could be used for further development. The memorandum also asked the government to study the Malayan rubber goods industry. As to the production of automobile tires and tubes, this should be in the hands of local people, aided if necessary by key technicians from abroad. There was already a plant in Malaya equipped to produce these goods for the domestic market and for export.

At present there are about 20 rubber goods factories in Malaya employing more than 3,000 people and using less than 4,000 tons of rubber annually.

New Industries Tax

A Pioneer Industries Bill, recently published, would grant a tax holiday to enterprises which meet the government's definition of "Pioneer Industry." No lower limit has been set on the amount to be invested to qualify for tax exemption up to two years. Where capital expenditure is not less than $100,000 (Straits), tax relief will be extended for a further year. If capital expenditure is not less than $250,000, the total exemption period is five years.

Spain

Factory for Guayule?

According to a recent report, the Empresa Nacional Calvo Sotelo, a company of the National Institute for Industries, Spain, has decided to start a factory in Huelva, to extract guayule rubber from locally grown shrubs which will have an annual capacity of 3,000 tons. It seems that the studies conducted in the Province of Huelva since 1946 have been successful, and the experimental phase in the growing and extracting of guayule is now over. The experiment station has a nursery of three hectares (about 7.5 acres); in addition, it disposes over guayule plantations covering 200 hectares. The yield is said to come to about 0.8-ton of high-grade rubber per hectare every fifth year, produced at a cost of 32 pesetas a kilogram (about 31.7¢ a pound), but it is expected to be able to reduce this to 28 pesetas per kilogram (about 27.7¢ a pound) on an industrial scale.

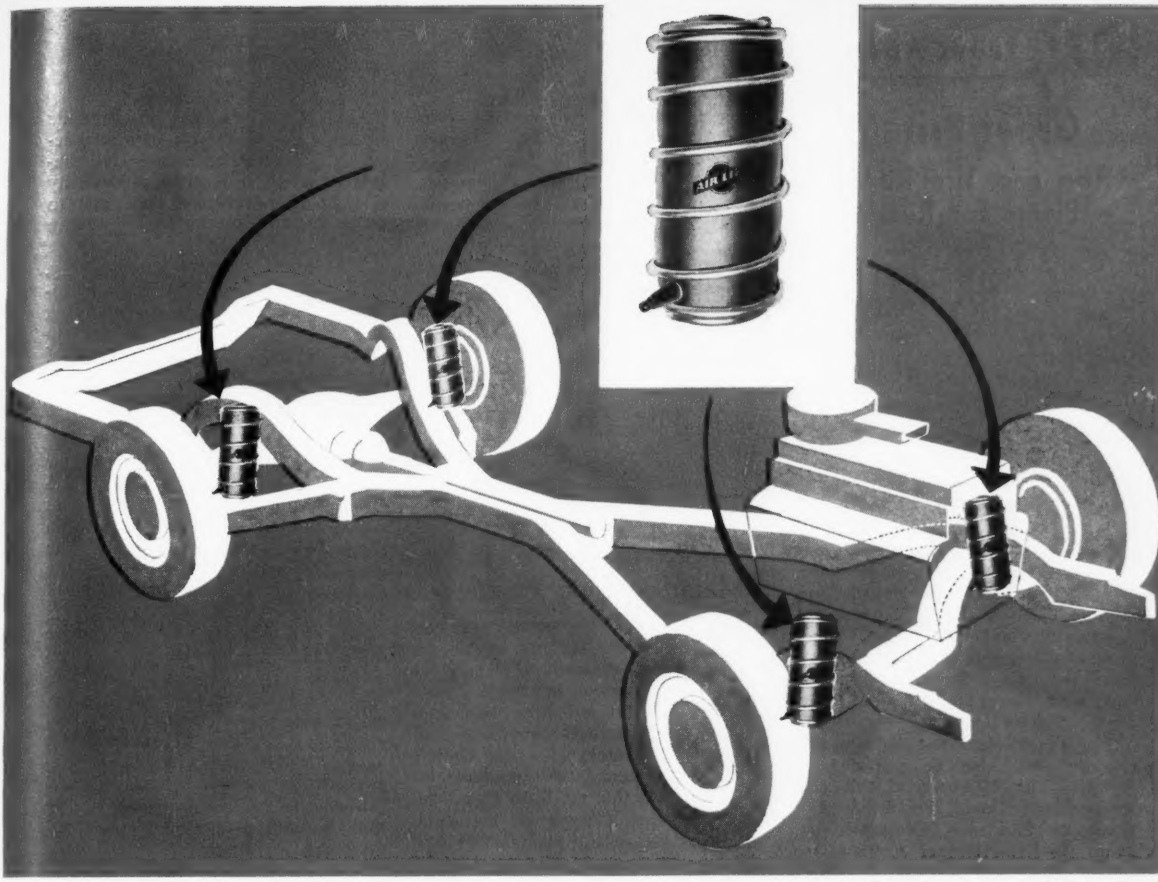
Rubber Institute

In connection with the inauguration of the recently established Spanish Rubber Institute, at Barcelona, an International Rubber Week was held in that city during October 14-19, 1957, when representatives of Spanish and foreign firms (including American) presented a number of papers dealing chiefly with new rubber compounds and reinforcing fillers.

The aims of the Spanish Rubber Institute are announced to be the giving of technical aid to rubber manufacturers and the provision of technical training in rubber on a level with that obtainable in most neighboring European countries. It is also planned to publish a monthly periodical on all developments in the rubber world.

Communist China

China plans to step up her exports of rubber footwear, and the state-operated Great China Mfg. Co., Shanghai, has set a production target of 1,570,000 dozen pairs of rubber footwear for export this year, the *Straits Times* says, quoting a report in a Chinese publication. According to the latter source, China recently signed trade agreements with Burma, Ceylon, Rumania, Finland, and Syria, covering rubber footwear purchases. In addition, about 10 countries are said to have signed contracts for Chinese tires for motor vehicles. Last year China exported about 20,000 tires; lately she has made shipments to Indonesia.



Pneumatic Spring Controls are made with Enjay Butyl to provide quieter, softer cushioning in automobiles.

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Enjay Butyl Rubber is used by the Armstrong Rubber Company, West Haven, Connecticut, in the production of Air Lift Pneumatic Spring Controls for the Air Lift Company, Lansing, Michigan. Butyl Air Lift units are inserted between leaf spring and frame to support overloads and cushion all moving parts of suspension. Inflatable to meet load requirements, these units protect vehicles–provide a smoother, safer ride.

Each week the Armstrong Rubber Company turns out thousands of Air Lift units made from Enjay Butyl Rubber. They chose Enjay Butyl because of its superior air retention and resistance to aging. Since tough, weatherproof Butyl is low in cost, it may be the answer to lower production costs for you. For complete information and expert technical assistance, call or write the Enjay Company.

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Great Britain

Tire and Tire Repair Plants for Russia

Last March, Russia completed the contract for equipment to be supplied by Rustyfa, Ltd., a consortium of British engineering firms for the huge tire factory under construction at Dniepopetrovsk, in the Ukraine. Together with the first part of the contract, placed about a year ago, the order is said to be worth £10,000,000 to £15,000,000. The factory, designed for an annual capacity of 2,000,000 tires, will embody the latest practice of the Western world in tire manufacture, H. H. Spencer, general manager of Rustyfa, is quoted as saying. Certain machines made under American license in the United Kingdom for many years will be included. Apparently the United States Department of Commerce in Washington has given permission for the use of the equipment. No military tires are to be produced, it is added.

Tire repair plant for 250,000 tires annually will also be provided by Rustyfa. The members of this consortium are David Bridge & Co., Crompton Parkinson, Lancashire Dynamo Holdings, Mather & Platt, and Francis Shaw & Co., Ltd. In addition to these firms, some 50 British subcontractors will benefit from the order.

Monsanto Buying into Cole

Under a recently announced arrangement, Monsanto Chemicals, Ltd., will acquire, as an investment, 50% of the ordinary shares of R. H. Cole & Co., Ltd., a private company engaged in the marketing of raw materials and equipment to the plastics, chemical, and electrical industries. The Cole company will remain a separate entity under its own board of directors, with R. Hugh Cole and Peter H. Cole continuing as joint managing directors.

Nitrile Sponge Aid

Cellobond H 832 is a liquid phenolic resin recommended by British Resin Products, Ltd., London, as a processing aid for nitrile rubber sponge. The product is said to provide efficient plasticization and at the same time to reinforce nitrile rubber, while its high degree of compatibility insures complete dispersion, resulting in uniform cell structure and a high blow ratio. The sponge produced is strong, resilient, dimensionally stable, and resistant to heat and oil.

Compared with dibutyl phthalates, equal proportions of Cellobond give higher blow ratio, lower density, lower compression set, and higher split tear values. Thus the following properties were found for two samples of a nitrile rubber compound one of which (A), included 50 parts of dibutyl phthalate, and the other (B), 50 parts Cellobond and 5 of hexamine:

	A	B
Blow ratio	1:2.2	1:3.3
Density (lb./cu.ft.)	36	16
Compression set (%)	10	7.8
Split tear (lb./in. width)	2.0	8.8

Russia

Improvements in Tire Manufacturing Planned

In connection with the news of the big Russian order for tire equipment from a British consortium, it may be of interest to mention information now available on Russian tire plans and problems. One source reminds us that Russia has become, after the United States, the second largest producer of tires and adds that the Sixth Five-Year Plan embodies the use of the most up-to-date methods of manufacture and the modernization of existing plant in order to double the 1955 output of pneumatic tires by 1960.

At the same time, it is recognized that the quality of Russian tires must be improved to bring them up to the standard of the best foreign-made tires. For it seems that though considerable advances have already been made in this direction, there is still much to be done; the life of tires made before 1956, for instance, is shorter than that of the best foreign makes, a condition ascribed to the inadequate quality of raw materials. It is therefore proposed to replace SKB (sodium butadiene) rubber now used in tires, by styrene-butadiene rubber. For this, Western experience is to be utilized, and the oil-extended type chiefly is to be made.

It is expected that synthetic isoprene rubber will be used for tire carcasses and breakers. Butyl, isocyanate, methyl butadiene, vinyl pyridine, and other rubbers are also mentioned as materials to be used by the industry, in addition to various latices, high-grade carbon blacks, and large amounts of rayon and nylon cord; the quality of the cord is to be raised to equal that of the best Western products.

Construction and design of tires are to be improved; obsolete types are to be completely superseded by new types; development of tubeless tires is to be intensified. Serious production of Pobeda tubeless tires was begun in 1957, and tests are in progress on the production of such tires for heavy duty.

[1] Rubber World, May, 1958, p. 287.

Among the advances already made are noted the production of a semi-active carbon black from liquid raw materials and the increase in productivity in building heavy-duty tires, said to be up to twice that of West European works.

In 1955 the Jaroslavl tire factory, the biggest of its kind in Russia, introduced a new system for manufacturing treads continuously, from mixer to tread unit, in 20 minutes instead of 325 minutes as previously (this included a conditioning period of 270 minutes during which control samples were tested).

This is made possible by a new accelerated testing method, taking 1.5 to 3.0 minutes, in which the samples are vulcanized at 180-210° C. in an Electro press built in the works. The procedure seems to be to prepare the compound in a mixing period of 11 minutes; then the mix is transferred, by conveyor belt, to 84-inch rolls, where sulfur and other ingredients are incorporated; processing takes nine minutes. About 2-3 minutes before this operation is completed, a sample is taken, vulcanized, and tested; a go-ahead light indicates the sample has been approved. The material is then cut and conveyed to the tread extruder in strip form; cutting to size and control of tread strip are automatic.

Germany

The newest processes developed by National Lead Co., New York, N. Y., U.S.A., for the production of titanium dioxide will be used by Farbenfabriken Bayer, A.G., in its large new factory now being constructed at Uerdingen/Krefeld. The first part of the plant, already completed, began to operate toward the end of 1957; it is expected to produce one-third of the projected annual output of 50,000 tons, and at first the anatase-type pigment will be made and shortly thereafter rutile.

Building on the second section is now in progress, and preparations have been made for the third. Bayer has been collaborating with National Lead for a number of years.

Austria

Austrian imports of natural rubber and gutta percha totaled 10,127 tons in 1956, in addition to 2,965 tons of synthetic rubber. In the first quarter of 1957, the amounts were 2,773 tons of natural and 654.5 tons of synthetic rubber. About 18% of the new rubber consumed in 1956 consisted of synthetic rubber.

(*Continued on page 645*)

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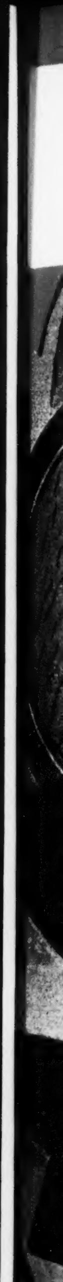

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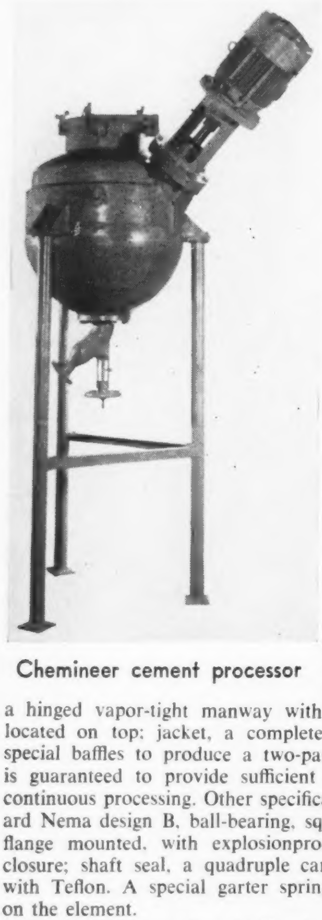
NEW EQUIPMENT

New Cement Processors



Chemineer cement processor

Chemineer, Inc., Dayton, O., has introduced a new standard line of four rubber cement processors, in capacities for 50-, 100-, 250-, and 500-gallon batches. The processors have been redesigned to eliminate shaft seal problems and to reduce mixing time.

The use of Teflon cartridge seals instead of the old-style stuffing box indicates that the majority of the power can be invested in the mixing job rather than consumed in the seal. Location of the seal assembly is above the batch level, and it is automatically scrubbed clean at the beginning of each batch. Seal replacement, when required, is accomplished without disturbing the motor or dismantling the unit.

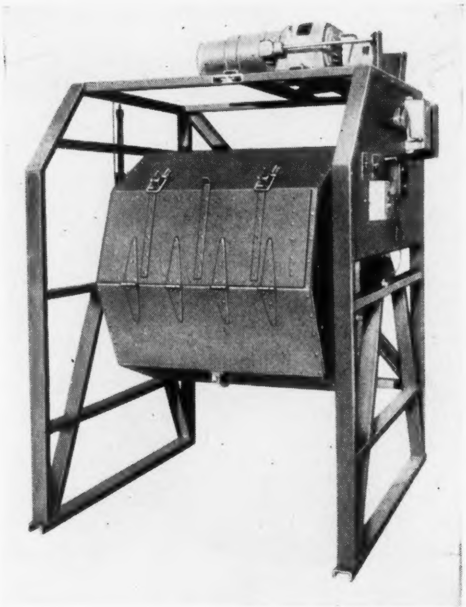
Some of the general specifications follow: construction, carbon steel throughout, arc welded; vessel, hemi-spherical type with minimum straight side, and a hinged vapor-tight manway with swing clamps and a vent located on top; jacket, a complete external shell jacket with special baffles to produce a two-pass coolant flow. The jacket is guaranteed to provide sufficient cooling capacity to permit continuous processing. Other specifications include: motor, standard Nema design B, ball-bearing, squirrel-cage induction motor, flange mounted, with explosionproof, Class I, Group D enclosure; shaft seal, a quadruple cartridge seal system is used, with Teflon. A special garter spring provides constant tension on the element.

An SAE 1140 quality shafting is used for the agitator shaft. In seal region, the shaft is chrome plated and ground. The impeller is a special three-blade turbine type, providing a very high shear and a low fluid displacement characteristic. It is affixed to the shaft by a taper fit, to facilitate maintenance. Twin agitators are furnished on the 500-gallon unit. A direct reading mercury thermometer of the separable thermowell type provides temperature indication.

Additional data and technical information may be obtained from the company.

Liquid CO_2 Tumbler

A new low-temperature insulated tumbling barrel using liquid carbon dioxide (CO_2) instead of dry ice is reported to cut deflashing time 30-50% for soft molded rubber parts. The new unit, manufactured by Tumb-L-Matic, Inc., Stamford, Conn., develops temperatures ranging from 0° to —120° F. through direct expansion of liquid CO_2 within the barrel. Since it is a controlled temperature system, operating temperatures remain constant, giving more uniform results with a lower rate of rejection.



Tumb-L-Matic liquid CO_2 tumbler

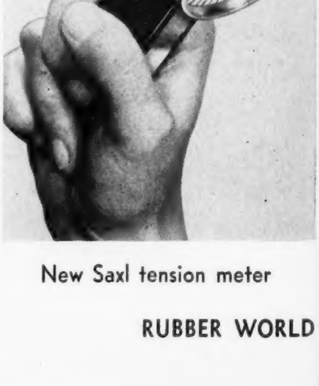
Completely self-contained, the Tumb-L-Matic liquid CO_2 unit eliminates the storage and handling problems found in conventional dry-ice systems. With liquid CO_2 there is no storage loss, and a separate storage area is not needed.

With the unit, the liquid CO_2 is introduced through a copper tube to an injection valve within the barrel at the hollow bearing shaft. As the liquid CO_2 enters the barrel, a typical refrigerant effect occurs. The expanding gas picks up heat from the work in the barrel, chilling it to the desired temperature.

The tumbling unit consists of an octagonal barrel, channel iron frame and supports, gearhead drive motor, and self-contained automatic temperature regulating system. Controls for machine operation and refrigerant system are mounted at operator level on an integral control panel. The temperature controls include 110-volt indicating thermostat, and a spring-actuated mechanical timer. The unit is available in various sizes.

New Saxl Tension Meter

Featuring low deflection and negligible contraction of the yarn, the tension of which is to be measured, the new Saxl tension meter adds the feature of quick, automatic trigger action to the measurement of tension during yarn processing. Owing to the negligible yarn contraction it is possible now to make measurements of yarn tension and rubber strands, for instance, in narrow-fabric looms where tension-measurement was impossible with the type of Tensometer that required wiggling-in. The completely novel design of a rigid aluminum body supports solidly the trigger mechanism and the precision movement.



New Saxl tension meter

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ORLD

Winning twosome...

PHILPRENE* and PHILBLACK*!

Philprene and Philblack pair up for championship performance in your rubber products! Easy-processing Philblack helps you avoid operational hazards and traps . . . helps you get the maximum in trouble-free performance in extruded, molded or sheet goods. And Philprene versatility (21 different polymers to choose from!) enables you to select the physical properties you want most in your finished product. For complete information about the Philprenes and the Philblacks, consult your Phillips technical representative.

*A trademark

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LET ALL THE PHILBLACKS WORK FOR YOU!

A — **Philblack A,** Fast Extrusion Furnace Black. Excellent tubing molding, calendering, finish! Mixes easily. Disperses heat. Non-staining.

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I — **Philblack I,** Intermediate Super Abrasion Furnace Black. Superior abrasion. More tread miles at moderate cost.

E — **Philblack E,** Super Abrasion Furnace Black. Toughest black yet! Extreme resistance to abrasion.

CURRENT PHILPRENE POLYMERS

	NON-PIGMENTED	PIGMENTED WITH PHILBLACK
HOT	PHILPRENE 1000 PHILPRENE 1001 PHILPRENE 1006 PHILPRENE 1009 PHILPRENE 1010 PHILPRENE 1018 PHILPRENE 1019	PHILPRENE 1100 (Pigmented with EPC Black) PHILPRENE 1104
COLD	PHILPRENE 1500 PHILPRENE 1502 PHILPRENE 1503	PHILPRENE 1600 PHILPRENE 1601 PHILPRENE 1605
COLD OIL	PHILPRENE 1703 PHILPRENE 1706 PHILPRENE 1708 PHILPRENE 1712	PHILPRENE 1803 PHILPRENE 1805

PHILLIPS CHEMICAL COMPANY

Rubber Chemicals Division, 318 Water Street, Akron 8, Ohio
District Offices: Chicago, Providence and Trenton
Warehouses: Akron, Boston, Chicago, Trenton
Export Office: 80 Broadway, New York 5, N. Y.
European Sales Office: Limmatquai 70, Zurich 1, Switzerland

*A Trademark

New Equipment

To operate the Tension meter, one cocks the trigger the way a gun is cocked. This opens the three-roller mechanism for yarn insertion. The yarn is placed upon the two outer rollers, recessed into the plate so that the yarn cannot get caught in back of the pulleys. Upon release of the trigger the yarn slips automatically into the wheel grooves. The center roller deflects against the restraint of a calibrated spring of special construction. This motion is mechanically amplified over a gage movement. Thus, on a dial facing the observer, the tension of the material shows directly.

The automatic inserting mechanism eliminates the multiple wiggling-in, needed for certain types of Tensometers used heretofore. A transparent flywheel mounted on the pivot steadies the readings, thus giving smooth averaging of all practical conditions encountered.

The Saxl tension meter is manufactured by Tensitron, Inc., Harvard, Mass.

Exacta Rubber Tester

"Exacta" hardness tester

A new portable hand rubber tester, "Exacta," is being distributed by Epic, Inc., New York, N. Y. It is a pocket-size instrument, easy to use, to determine quickly the hardness of rubber or plastic materials.

The instrument is made in accordance with ASTM D 674-49T and is equipped with a silver steel hardened, ground, and polished test prong. The accuracy of the instrument can be tested at any time by using a special test plate supplied with each instrument.

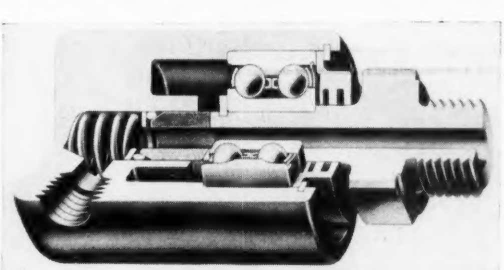
The scale is graduated in the same 0-100 units as the American Shore A hardness tester. Special models for testing hard rubber in accordance with Shore C and D scales are also available. The weight of the standard model is approximately five ounces. It is manufactured by Heinrich Bareiss-Apparatebau, Oberdischingen, West Germany.

New Fawick Rotorseals

Fawick Airflex Division of Fawick Corp., Cleveland, O., has announced the availability of standard B2 and C2 Rotorseals which never require additional lubrication. This new design features factory-lubricated and sealed ball bearings.

These Rotorseals are compact devices for transmitting air, liquids, or gases from stationary sources into rotating shafts. They are widely used on air-operated machinery and machine tools to transmit air pressure for operating Fawick Airflex clutches and brakes.

The shaft of the Rotorseal is applied directly to a tapped hole in the shaft of the machine and rotates on sealed ball bearings within the housing. The entire unit is connected to the pressure source by a flexible hose. Positive protection against pressure leakage is provided by a non-metallic sealing ring held against the Rotorseal shaft by spring pressure. The sealing surfaces are precision-lapped to assure trouble-free operation.



B2 & C2 Rotorseals

Fawick B2 and C2 Rotorseals are applicable to all types of single-passage applications at pressures to 150 psi. The B2 model will operate at speeds to 4,000 rpm.; the C2, to 3,000 rpm.

Other types of Fawick single-passage Rotorseals are available for large-volume use and for small-volume pressure or vacuum use. Multiple-passage Rotorseals, used to transmit air, liquids, or gases to two or more rotating members on the same shaft, are available in standard dual- and triple-passage models, with other multiple passage and special-purpose models available to meet specific requirements.

S-C NPT Three-Way NC Valve

A ¼-inch NPT 125-psi. three-way NC valve, especially designed for steam, hot and cold water, air and gas service, has been announced by The Sinclair-Collins Valve Co., Akron, O. The diaphragm-operated valve is said to offer compact design for simplified installation, leakfree performance, low initial cost, and minimum maintenance.

Body, yoke, ring, and piston are cast Navy M bronze, with cast-iron body optional. Disk holders and gland nuts are bar brass; stem is stainless steel, and spring is chrome silicon steel. Adjustable stem packers and special composition seats assure leakfree operation in the specified service, claims the company. Both stem packing and seat disks are easily replaced, when maintenance is finally required.

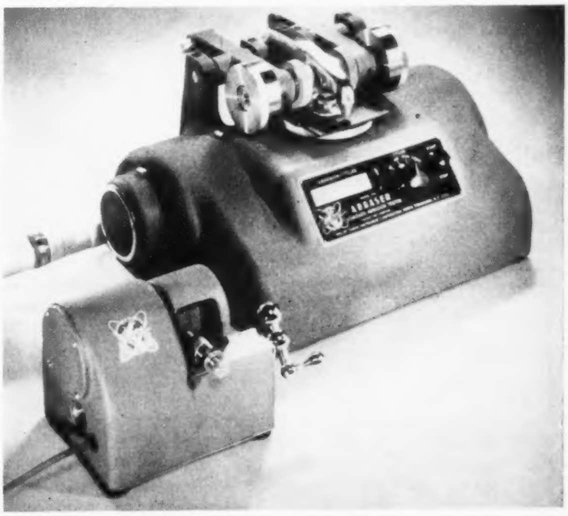
Sinclair-Collins also manufactures a complete line of ½-inch to three-inch NPT diaphragm-operated medium- and high-pressure control valves. Further information may be obtained from the company.

Improved Abrasion Testing Set

The 1958 model Taber abrasion testing set consists of the laboratory abraser and wheel refacer (115 volts, 50 or 60 cycles) plus accessories and supplies. This new improved Model 174 abraser incorporates a built-in motor with a worm reduction drive for uniform high torque, an automatic stop electric counter, and a new selector circuit.

This new selector circuit insures that each abrasion cycle is counted exactly, regardless of the multiple stops and starts that can be made intermittently throughout an abrasion test, to inspect a specimen. A new motor-driven fan forces cooling air around the motor and through the interior of the aluminum housing,

(*Continued on page 630*)



Taber abrasion testing set

NEW MATERIALS

Delac-S Accelerator

Naugatuck Chemical Division, United States Rubber Co., Naugatuck, Conn., has announced a delayed-action accelerator for natural and synthetic rubbers. Called Delac-S, it is N-cyclohexyl-2-benzothiazole sulfenamide, a standard sulfenamide. It is an all-purpose accelerator used in tires, footwear, soling, and mechanical goods and is generally useful in natural rubber as well as in SBR and nitrile rubbers such as Paracril.

Delac-S is said to combine the advantages of superior scorch safety in the mill room with shorter curing cycles in the press room. This valuable combination of properties results in overall greater productivity in the rubber plant, according to the manufacturer. It is claimed to provide these advantages at a lower cost than other commercial sulfenamide delayed-action accelerators.

Some typical properties of Delac-S are:

Form	cream-colored powder
Specific gravity	1.27
Melting range	95–100° C.
Storage stability	good
Solubility	soluble in acetone, ethylene dichloride, and benzol. Insoluble in water and gasoline.
Handling precautions	none

A technical bulletin providing general compounding and processing characteristics of Delac-S, various formulations for different applications, and description and properties is available from the company.

Rigithane 112 Resin

Rigithane 112 resin, a versatile resin for the manufacture of rigid and semi-rigid urethane foams, is now available from the Thiokol Chemical Corp., Trenton, N. J. The resin may be foamed in place to produce a lightweight cellular material adaptable for a wide range of applications and can be cured at room temperatures.

Foams prepared from Rigithane 112 resin have a number of outstanding properties which include the ability to be foamed in place either by pouring or spraying; good strength with light weight; good thermal insulation properties; good adhesion to metal, wood, glass, and fabrics; good energy absorption for sound or vibration dampening; and flexibility in formulating over a wide range of densities and properties.

Some typical specifications of Rigithane follow:

Specific gravity at 80° F.	1.130–0.010
Viscosity at 80° F.	125–40 poises
Color	light amber
% NCO	14.7–1.0

A technical bulletin, "Thiokol Rigithane 112 Resin," giving processing information, typical properties of Rigithane foams, and suggested uses for the foams, is available from the company.

Also available is a technical bulletin, "Solithane 113 Coatings," a resin recommended in formulations for two-package mix urethane coatings which have excellent impact and abrasion resistance, flexibility, toughness, gloss, and clarity. Coatings of this resin are said to have chemical and solvent resistance and interesting electrical properties. They are adaptable for applications on metals, wood, concrete, ceramics, rubber, textiles, various types of plastics, paper, and glass.

Neoprene Type FB

Neoprene FB, a viscous, but pourable fluid elastomer at moderately elevated temperatures, has been announced by the elastomer chemicals department, E. I. du Pont de Nemours & Co., Inc., Wilmington, Del. Owing to its relatively high crystallinity in the raw state, it has a soft-solid consistency at room temperature, while it becomes more fluid at higher temperatures.

Calks that neither shrink nor slump, and binders that hold large amounts of fibers and abrasives can be made from Neoprene Type FB, without solvent, according to the manufacturer. Very high solids cements also are possible for adhesive and coating applications. With other neoprenes and with other synthetic rubbers Type FB is said to be an effective non-volatile, non-extractable, curable plasticizer. It is a good processing aid for smoothing out stocks without decreasing vulcanizate hardness. The physical characteristics of this polymer follow:

Composition	a stabilized chloroprene polymer of low molecular weight
Specific gravity	1.23
Appearance	viscous, dark-colored fluid which crystallizes to a soft solid in a few weeks at room temperature
Odor	slight characteristic of neoprene
Viscosity, Brookfield, cps. at 122° F.	800,000–1,200,000
Storage stability	fair
Solubilities	soluble in aromatic and chlorinated hydrocarbons and in certain esters and ketones, either alone or in blends with aliphatic hydrocarbons
Crystallization rate	moderate
Health hazards	none
Compatibility with other elastomers	generally excellent

A technical bulletin, Neoprene Type FB, Report No. 58-6, which describes the new material, how to compound and process it and its cured properties, is available from the company.

S-1506 and S-1804

Shell Chemical Corp., Torrance, Calif., recently introduced two new SBR-type polymers: S-1506 and S-1804.

S-1506 is a clear, light-colored polymer prepared with mixed soaps of rosin and fatty acids and containing a non-staining stabilizer. It is a cold rubber version of SBR-1010, with a lower average Mooney viscosity and superior tensile properties. It is especially suitable, it is claimed, for chemically blown sponge. The plasticizing step and the use of costly peptizing agents normally required with higher Mooney polymers can be eliminated. Specifications of S-1506 appear in the table below.

S-1804 is a masterbatch of 10 parts of a highly aromatic oil and 60 parts of HAF black in 100 parts of S-1500 type of polymer. S-1804 is manufactured using a rosin acid soap and a staining stabilizer. This masterbatch is said to be especially suitable for use in the manufacture of tread rubber and is particularly attractive because of the shorter mixing time required. Additionally, S-1804 is well suited for many types of molded and extruded mechanical goods.

Some specifications of S-1506 and S-1804 follow:

	S-1506		S-1804	
Properties of Raw Polymers	Min.	Max.	Min.	Max.
Volatile matter, % w	—	0.75	—	1.00
Ash, % w	—	0.75	—	1.50
Rosin acid, % w	—	—	2.8	.52
Organic acid (mixed), % w	3.50	5.75	—	—
Soap, % w	—	0.10	—	0.5
Bound styrene, % w	22.5	24.5	22.5	24.5
Viscosity, ML-4 @ 212° F.	20	30	—	—
Carbon black (HAF), % w	—	—	34.0	36.6

Technical data sheets, SC: 58-60 and SC: 58-61, giving properties of compounded test stocks and test formulae of S-1506 and S-1804, respectively, are available from the company.

NEW RUBBER SOLVENT INCREASES PRODUCTION WITH SHORTER DRYING TIME!

ESPESOL 165's Narrow boiling range reduces handling time —improves quality of end product!

NEW ESPESOL 165 aliphatic solvent offers rubber processors a *narrow boiling range of 165 to 225 degrees F* with a low-odor factor. This narrow cut with its low end point offers a much shorter drying time and a substantial increase in production.

ESPESOL 165's higher initial boiling point offers less evaporation loss and permits greater solvent recovery. The solvent's unusually short distillation range offers two additional benefits: 1. Improved quality of end products. 2. Reduction in amount of solvent used.

Because the use of ESPESOL 165 can reduce handling time, increase production and improve the quality of your end products, this outstanding new solvent deserves the consideration of your organization. Send for the complete ESPESOL 165 story. Brochure containing characteristics and properties yours free on request. (No delivery problems! Eastern maintains adequate stocks of this unique product at all times.)

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New Materials

Kel-F 5500/Kel-F 820

Kel-F Brand 5500 Elastomer and Kel-F Brand 820 Resin are copolymers of chlorotrifluoroethylene and vinylidene fluoride in which thermal stability and chemical resistance are combined to an exceptional degree. These materials are now available in the form of high solids, stable latices from Jersey City chemical division, Minnesota Mining & Mfg. Co., Jersey City, N. J.

For the first time, according to the firm, a synthetic rubber and a resin capable of withstanding 400-450° F. and resisting the attack of acids, oxidants, fuels, and oils can be applied from latex to satisfy applications where dry milled compounds and solvent cements are impractical.

Suggested uses for Kel-F Elastomer 5500 latex are: supported or unsupported films having extreme thermal stability combined with fuel, oil, and chemical resistance; dipped goods such as acid-resistant gloves and footwear; coated fabrics for protective clothing; and saturated thread, roving, sleeving, and braid for chemical and electrical service.

Kel-F 820 Resin latex is suggested for: saturants for braid and fabric to be used where excessive oxidant resistance and thermal stability are desired; fuel cells, especially for oxidants; expellant bladders; and spray coatings over metallic surfaces for tank, valve, and pipe linings.

Blends of Kel-F 820 with Kel-F 5500 in proportions of 50% or greater are said to look promising as cable coatings for electrical insulation. A blend is also recommended for extreme resistance to oxidants such as nitric acid and hydrogen peroxide. In many cases, blends are indicated because of the better film-forming properties of the 5500 latex, which forms a continuous film at room temperatures where the 820 latex does not. High proportions of the 820 latex, however, increase toughness, hardness, and oxidant resistance.

Kel-F Elastomer 5500 latex is a stable dispersion of very fine rubber particles in water. Kel-F 820 Resin latex is a stable dispersion of very fine resin particles in water. Some typical physical properties of the two latices are tabulated below:

	Kel-F 5500 Latex	Kel-F 820 Latex
Polymer solids, % by weight	60	60
pH	6–8	6–8
Particle size, microns	0.2–0.3	0.2–0.3
Specific gravity, 77° F	1.45	1.45
Viscosity, Brookfield 77° F., cp	57	34
Color	opaque white	opaque white
Mechanical stability	good	good
Storage stability	good	good
Polarity of particles:		
Polymer	negative	—
Resin	—	negative

A technical bulletin, NPI-6, giving further information on Kel-F Elastomer Latex and Kel-F 820 Resin Latex, is available from the company.

DNODA Plasticizer

Monsanto Chemical Co., St. Louis, Mo., has announced another addition to its line of more than 70 plasticizers with the commercial availability of DNODA [di(n-octyl, n-decyl) adipate]. A primary plasticizer for polyvinyl chloride, DNODA is said to impart excellent low-temperature flexibility and efficiency along with softness, performance, water resistance, and heat and light stability.

Primarily a plasticizer for polyvinyl chloride and chloride acetate copolymers, DNODA also is compatible and useful with nitrocellulose, ethyl cellulose, chlorinated rubber, SBR, and nitrile-type rubbers. It is said to be effective with polyvinyl butyal, cellulose acetate butyrate, polystyrene, methacrylate, and dammar. It is expected to find widespread use in film, sheeting and coated fabric, and extrusion compounds.

Some tentative specifications for DNODA follow:

Appearance	clear
Odor	characteristic
Color	APHA 50 maximum
Specific gravity, 25/25° C.	0.918–0.003
Refractive index, 25° C.	1.445–0.002
Moisture	0.1% maximum
Acidity	0.35 meq/mg. maximum; or 0.03% maximum (as adipic acid)

A technical data sheet listing the compound's properties and specifications is available from the company.

New "Carbium" Filler

Further broadening its diversified line of precipitated calcium carbonates for the paint, rubber, and plastics industries, Diamond Alkali Co., Silicote-Calcium-Detergent Division, Cleveland, O., has announced the development and availability of "Carbium," a new, low-cost grade of dense-type precipitated calcium carbonate. This new material is said to provide physical properties that make it suitable for use as a filler in rubber compounds. In these applications "Carbium" is said to provide fast mixing cycles, good dispersion, and color stability. In addition, its high loading tolerance enables the material to be used in compounds where low modulus and low cost are essential product or processing requirements, the manufacturer reports.

It is also said that "Carbium" is fully adaptable for use as a filler for polyvinyl chloride resins in that it meets all the requirements of cost, uniformity, processibility, and color stability in all PVC applications where these factors are principal considerations. Such PVC applications, according to the company, include extruded and calendered stocks, floor tile, plastisols, and organosols. In the latter two instances "Carbium" reportedly demonstrates both low initial viscosity and low viscosity buildup.

A typical analysis and typical physical properties of "Carbium" follow:

TYPICAL ANALYSIS

	%
$CaCO_3$	97.00
$MgCO_3$	0.80
Fe_2O_3	0.03
$CaSO_4$	0.40
SiO_2	0.04
H_2O loss @ 110° C.	0.25

PHYSICAL PROPERTIES

Linseed oil absorption, cc/100 grams	30–35
Packed density, lbs./cu. ft.	66–73
Specific gravity	2.65
Color	white
Particle size, microns	1–10

Technical bulletins giving more detailed information on "Carbium" are available from the manufacturer.

Abrasion Testing Set

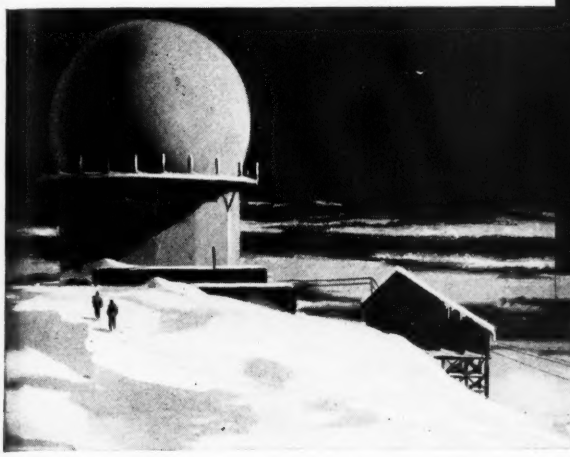
(Continued from page 627)

then exhausts it through dual rear ducts. This procedure, in turn, prevents temperature rise and eliminates softening effects on thermoplastic material.

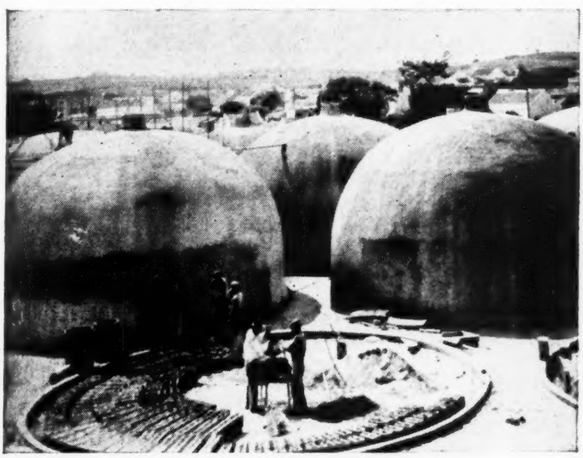
The completely new Model 200 wheel refacer has been specially designed to precision dress the abrading wheels of the abraser. The wheel refacer incorporates a capacitor type of heavy-duty motor, sealed bearings, and oversized motor shaft within its streamlined aluminum housing. This construction insures vibration-free wheel refacing and maintains wheel parallelism from wheel bore to the working surface of the wheels. New multiple diamond point dressing tools have been developed; tested in the laboratory, they have shown wheel refacing improvement over single point diamond tools.

A technical bulletin is available from the manufacturer, Taber Instrument Corp., North Tonawanda, N. Y.

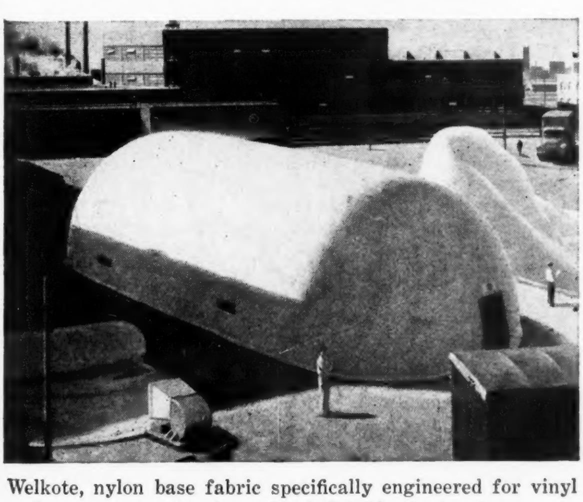
Unusual housing projects rest firmly on fabric!



Vital radar equipment is housed in pressurized radomes of strong rubberized Wellington Sears fabric.



Structure is made by spraying concrete over balloon of rubberized nylon. Nylon base fabric supplied by Wellington Sears.



Welkote, nylon base fabric specifically engineered for vinyl and neoprene coating, is used in inflatable air structure.

A shelter for our continental military defenses, a concrete storage building, an air-supported warehouse—all built with fabric. They represent still another group of new developments in industry made possible by the use of fabric in working combination with plastic, rubber, and other materials.

In housing projects of this kind—and in new irrigation tubing, fuel tanks, belts, hose and other products made through the coating, laminating, combining or frictioning of fabric—Wellington Sears figures importantly. With this experience, and over a century of background in industrial textiles, supplying a wide range of base fabrics for many purposes, Wellington Sears can help solve *your* fabric problem. Call on us, and for informative booklet, "Fabrics Plus," write Dept. H-7.

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NEW PRODUCTS

Nylon Heavy-Duty Tire

A new high-quality economy truck tire with all nylon cord has been announced by B. F. Goodrich Tire Co., Akron, O., for over-the-road service. Named the All-Nylon Heavy-Duty Express, and made in tubeless and tube-type, the new tire is available in 13 sizes, ranging from 6.70-15 to 10.00-22. The number of plies range from six to 12, depending on the size of the tire.

This tire is said to have a tread as thick as tires built for heavier service. As the tread meets the road across its entire width, hundreds of curves edging each rib give extra traction and increased resistance to skids.

The new tire has a Flex-Rite nylon cord body which withstands double the impact of ordinary cord materials and resists heat blowouts and flex breaks, according to the firm. As a result, the tire can be retreaded over and over, giving thousands of extra trouble-free miles of service. Two chafing strips reinforce the lower sidewalls of the tire. There are no cross threads in the construction to cause crimping and chafing.

U.S. Doe-Vin Elastic Naugahyde

United States Rubber Co., New York, N. Y., has introduced a new line of elastic-backed Naugahyde for home furniture, with an extremely soft, flexible hand and durable, semi-dull finish. Called U.S. Doe-Vin Elastic Naugahyde, the new upholstery is reasonably priced.

It was reported that its vinyl surface is compounded with non-migratory plasticizers, and by other manufacturing techniques the firm is producing a finished upholstery that will not sag or bag. Doe-Vin is said to have an extra dry, high slip finish that reduces soil pickup and gives great seating comfort.

This upholstery is 27 ounces in weight, with a strong elastic fiber backing. It is 54 inches wide and will be sold in 30-yard rolls through distributors and direct to large furniture manufacturers.

Advantages of Doe-Vin, according to the company, are its supple, skin-like feel, its controlled stretch, and the fact that it will tailor easily and keep its trim, tailored look.

U. S. Rubber is introducing its new Doe-Vin line in 20 colors: charcoal, antique white, tangerine, turquoise, mustard, ginger brown, celedon green, cerulean, cardinal, yew green, blue, citron, mocha, sand, persimmon, spice brown, grass green, oxblood, white, and black. All colors except white and black are blushed with a delicate vinyl ink print finish.

Unisteel Truck Tire

An entirely new type of over-the-road truck tire, built of steel cords instead of fabric plies and with possibilities of up to three times greater tread mileage, has been developed by The Goodyear Tire & Rubber Co., Akron, O. Named the Unisteel, the tire is composed of one steel cable ply running radially from bead to bead, reinforced by three diagonal steel breaker plies. This unique belted-type, locked-together construction is said to permit the tread to roll on the road without the wearing, scrubbing movement usually encountered in over-the-road tires. Flexing is confined to the tire's buoyant sidewalls. Other advantages, it was reported, include a reduction in rolling resistance, three times the previous resistance to punctures and cuts, and greatly improved cushioning.

Goodyear steel cord truck tire

This belted construction, according to the tire's designers, can result in greatly increased tread life and substantially reduced running temperature—up to 100° in certain operating conditions.

Because the tire requires a radical departure from conventional methods of manufacture, production may be limited at present, it was explained. The new tire calls for a dozen specially developed rubber compounds, each created for its specific job.

The tube-type Unisteel tire is being produced in sizes 7.50-20, 8.25-20, 9.00-20, 10.00-20, 11.00-20, and 10.00-22.

New Xtra Tred Truck Tire

Another new truck tire, one especially designed for rock excavating, mine and quarry work, also is being marketed by Goodyear. Named the Hard Rock Lug Xtra Tred, the tire is made with 3-T nylon cord and is said to have as much as 30% more rubber, by weight, in the tread.

This extra heft of tread rubber enables the tire to wear longer despite cutting and bruising hazards prevalent in rock excavating, mining and quarrying operations. Wide lugs and thick shoulders tapered down the side of the tire give it powerful pull, grab and traction. The tire's triple-tempered nylon cord increases its resistance to bruising and carcass breaks and aids to its retreadability. The tire is available in sizes ranging from 14.00-24 to 18.00-33, tube-type, and from 14.00-25 to 18.00-25, tubeless.

Accopac AN-890 Gasket Material

A high-density asbestos gasket material recently developed by Armstrong Cork Co., Lancaster, Pa., under the trade name, Accopac AN-890, now makes it possible for compressor manufacturers to get more efficient sealing of Freon refrigerants at a cost saving of 15-30%, according to the firm. The new material was developed after numerous tests to study the effects of elevated temperature and high internal pressure and the tendency of refrigerants to attack gasket materials.

Results of these tests were used in developing Accopac AN-890, which is said to cost less and to be more efficient than conventional asbestos materials used in such applications. Accopac AN-890 is made by a beater-saturated process pioneered and patented by Armstrong. This method refines the asbestos fibers and forms a homogeneous sheet that is tough and flexible. It die-cuts cleanly to the complex shapes often required by compressor designs.

The binder is a nitrile-type rubber latex that reacts to certain Freon atmospheres by swelling. In the confined flange, this swelling actually improves the sealing efficiency of the material, it is reported.

Accopac AN-890 maintains adequate bolt torque when tested in the presence of Freon at temperatures commonly developed in compressors. It comes in rolls, sheets, ribbons, or die-cut pieces.

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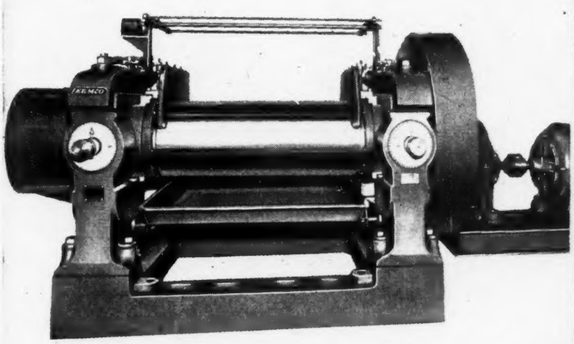

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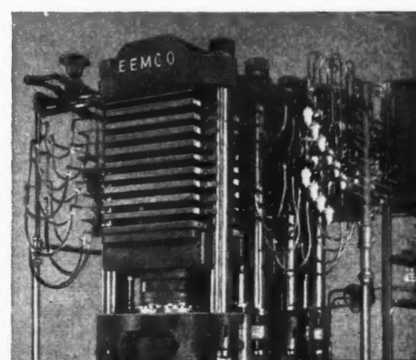
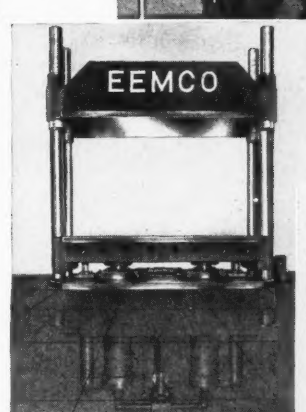
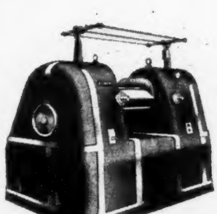
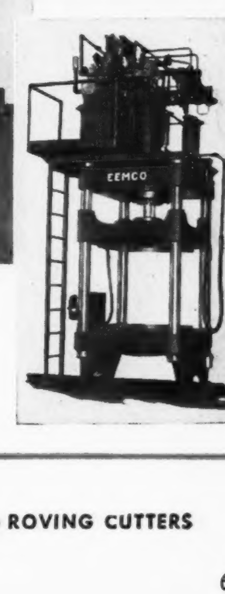


EEMCO furnishes complete installations for reinforced plastics molding—presses, hydraulic units, preform machines, roving cutters and ovens.







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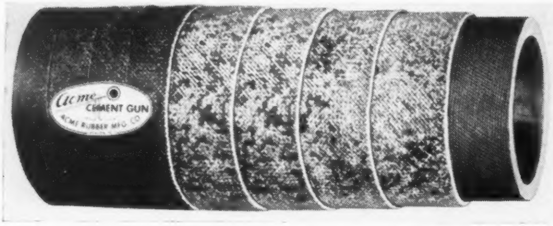
New Products



Acme cement gun hose

Acme Cement Gun Hose

The availability of a new line of hose for handling sand and cement mixtures has been announced by Acme Mfg. Co., Division of Acme-Hamilton Mfg. Corp., Trenton, N. J. Called Acme cement gun hose, it is used for spraying wet and dry cement on walls, reinforced wire structures, dam facings, swimming pool walls, etc. For these guniting applications, this hose is designed to withstand working pressures from 100 to 150 psi.

Made with a ¼ inch thick pure gum tube, a carcass consisting of four plies of wrapped duck, and a friction fabric cover, Acme cement gun hose is available with either a static wire or a static conducting tube to handle the static electricity generated by guniting applications.

Four sizes of Acme cement gun hose ranging from one- through two-inch ID are available. The weights of these sizes range from 84 to 159 pounds per 100 feet.

Resinite EP-145 Tubing

A new, tougher, and lighter extruded tubing for jacketing coaxial, umbilical, and other cables has been announced by the Borden Chemical Co., North Andover, Mass., and Santa Barbara, Calif. Known as Resinite EP-145, the new PVC material is described as an improved equivalent of Specification MIL-R-6855, Class II, Grade 60, synthetic rubber.

The product is reported to have from 11 to 31 times the abrasion resistance of neoprene at various test cycles and, in actual use, is considerably lighter than neoprene. The lower specific gravity, higher tensile strength, and greater abrasion resistance of Resinite EP-145 permit thinner walls and the use of less material, it is reported.

Resinite EP-145 does not deteriorate from exposure, according to the company. On the contrary, exposure is said to increase its tensile strength. The new material has unusually low-temperature, cold-bend, and impact strength. It remains flexible at temperatures below minus 100° F., it is said.

Flame resistant and self-extinguishing, Resinite EP-145 also surpasses requirements for hot-air aging, hot oil, and hot water immersions. Available in red and black, from ¼- to 1½-inch inside diameter, it is manufactured at the Massachusetts and California plants.

New Cellular Materials

American Biltrite Rubber Co., Chelsea, Mass., recently introduced its new complete line of industrial cellular materials in addition to its open-cell sponge for the shoe trade.

The company's new industrial line includes five grades of open-cell material named Sponge-Rite. These materials, available in rolls, meet ASTM specification D 1056-56T for sponge and expanded cellular rubber products, Types R-11, R-12, R-15, SC-11, and SC-12.

Besides, the company is marketing three grades of closed-cell material named Amcel. Available in sheets, these materials meet ASTM specification D 1056-56T for Types SC-41, SC-42, and SC-43.

Sponge-Rite and Amcel cellular materials have been developed by the company's research department to meet rigid requirements for use as gasketing, packing, and cushioning.

Coated Work Gloves

Rubber coated work glove

A complete new line of neoprene, vinyl plastic, and rubber coated work gloves has been introduced by the industrial glove division of Riegel Textile Corp., New York, N. Y.

The neoprene gloves are claimed to be liquidproof, resist acids, solvents, and caustics and are also recommended wherever heat, snagging, or cutting is a danger.

The fully coated vinyl plastic gloves are said to be three or four times more effective against oil than are ordinary plastic gloves. Riegel also claims protection against solvents and abrasives, superior finger dexterity, and improved hand comfort.

A positive grip, and excellent resistance to cutting, abrasions, heat, and punctures are also claimed for the natural rubber coated group.

Riegel has also announced that a new illustrated catalog showing its entire industrial glove line is now available for the first time.

New Rock Rib LCM Tire

A rugged new tire, called the Rock Rib LCM, for use in rough terrain by the construction, mining, and logging industries has been introduced by The General Tire & Rubber Co., Akron, O. The new tire, constructed of General's exclusive Nygen cord, has an ultra-heavy ribbed tread with a variable slope in the groove design which is said to aid in the ejection of stones and rock fragments. The tire's thick tread and shoulders consist of a specially compounded, cut-resistant rubber stock. Four Nygen cord shock plies buttress the 12- to 20-ply tire body.

The Rock Rib was designed for use on front wheels of quarry, logging, and earthmoving equipment as well as for other heavy equipment operating in rugged terrain. Providing maximum steering ease, the tire reduces side slippage to a new low, reports the manufacturer.

The combination of thick, tough rubber composition and Nygen cord construction imbues the tire with great resistance to impact, cutting, and penetration. The wide, flat tread is claimed to deliver long, even wear. The Rock Rib LCM produced at General's Akron, O., and Waco, Tex., plants comes in sizes 10.00 x 20 through 14.00 x 25. It is available in tubeless construction in sizes 12.00 x 25 and 14.00 x 25.

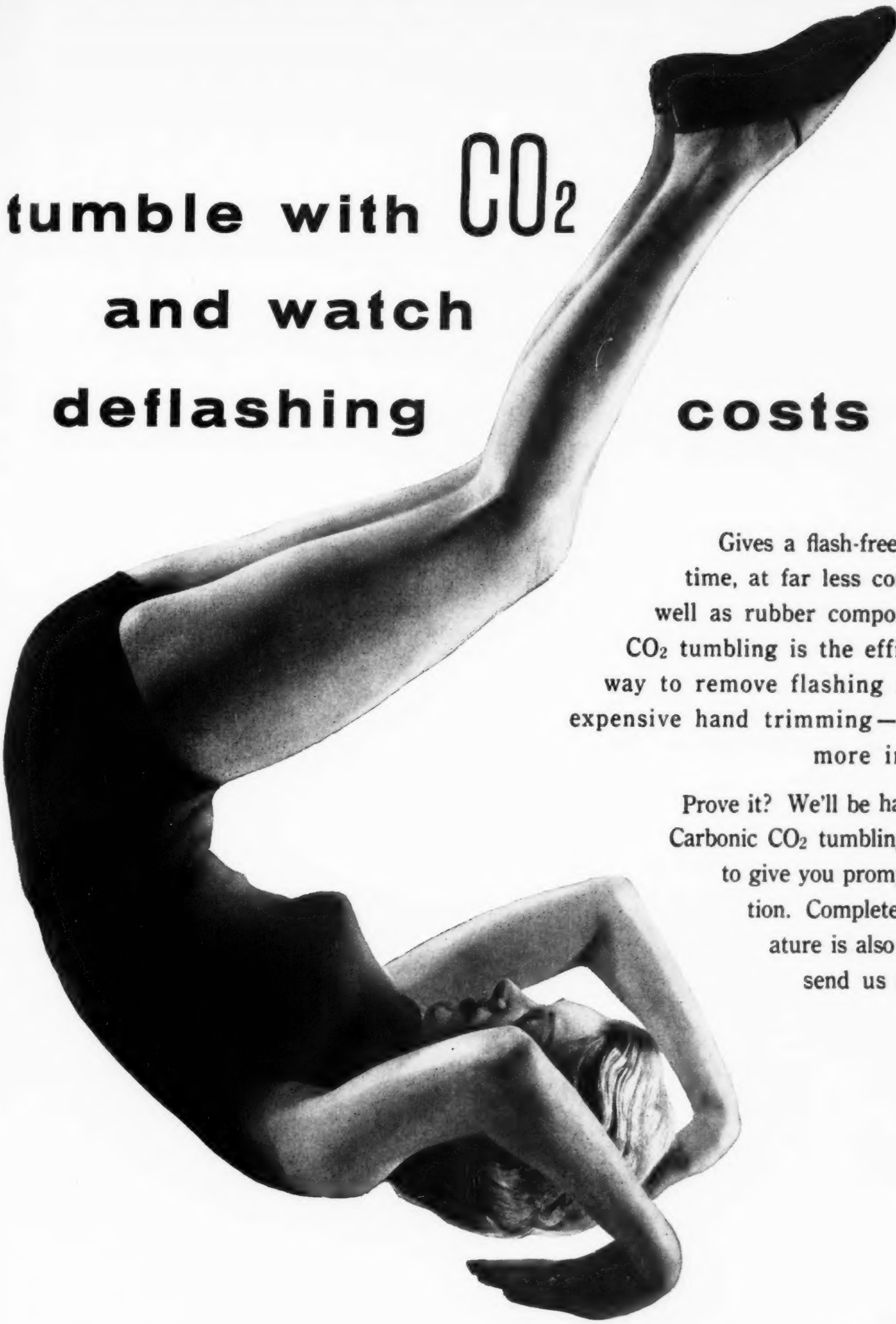
New Textile Rolls

Two new textile rolls have been announced by the Manhattan Rubber Division, Raybestos-Manhattan, Inc., Passaic, N. J. The rolls are known as Textractor and Texroc and are used in extracting liquids on mangles, mercerizers, wringers, ranges, and other dye and bleachery operations. They are said to work efficiently as a pair, but either roll may be used separately to suit the installation.

Manhattan Textractor roll is reported to be more crack-resistant and to extract more water than conventional rubber covered rolls, and the cushion-like nip prevents crushing. Cloth crushing, as usually experienced with ordinary rolls, is eliminated.

Manhattan Texroc roll is an entirely new type of hard white rubber roll that extracts up to 10% more water than metal rolls, minimizes chemical and dye build-up and eliminates pitting. The manufacturer claims both rolls permit maximum and uniform edge-to-edge water removal and have longer roll life.

tumble with CO_2 and watch deflashing costs drop



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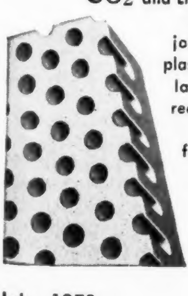

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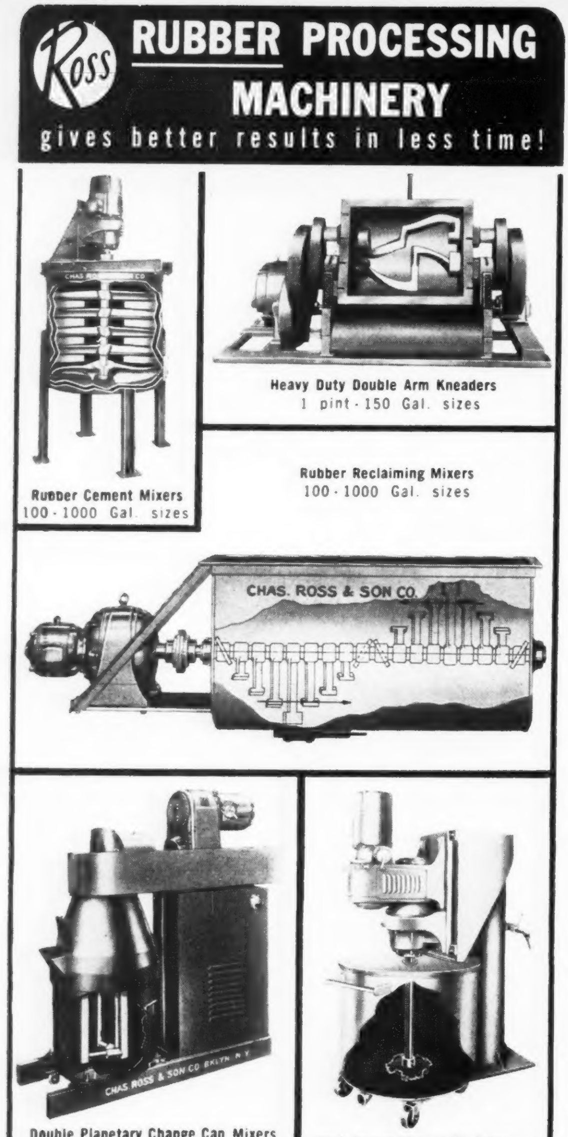

TECHNICAL BOOKS

BOOK REVIEWS

"Rubber Developments in Latin America." By D. M. Phelps, University of Michigan. Michigan Business Studies, Volume XIII, No. 3. Published by Bureau of Business Research, School of Business Administration, University of Michigan, Ann Arbor, 1957. Cloth, 6 by 9 inches, 180 pages. Tables and charts. Price, $5.

This study was first undertaken as an assignment from the Department of Social & Economic Affairs Organization of American States, as a result of a resolution adopted in 1951. Later it was taken over by Professor Phelps as an individual research project and financed in part by research funds made available by the University of Michigan. A research grant enabled Professor Phelps to visit Brazil in 1954.

The main problem considered in this work is whether the expansion of rubber production in Latin America is economically feasible, and in this connection various associated questions have been discussed, such as: world rubber demand and supply, competitive position of rubber suppliers in the Far East, in Africa, and in the Americas; development and adequacy of synthetic rubbers, demand and supply of natural rubber, and manufacturing in Latin America; foreign investment, political security, and government control.

The world demand and supply situation for rubber is favorable to an expansion of natural rubber in this hemisphere or elsewhere. With regard to Latin America, consumption in 1955 was about 120,000 long tons (including 100,000 tons in local manufactures and the rest as component of imported goods); while production of natural rubber here was only 28,000 tons, and the deficiency between production and consumption is increasing, largely as the outcome of the great advances in motorization.

Dr. Phelps considers in detail the projects for meeting this deficit, especially in Brazil. There are lands suitable for rubber growing in at least 13 countries in Latin America, he says; their position as potential producers of plantation rubber has improved since World War II, on the one hand because of the political tensions and increasing demands by labor in the Far East, and, on the other, because efficient means of controlling South American leaf disease have been developed. He finds, however, that though the problem of handling the disease itself is generally regarded by companies as well on the way to solution, there is still uncertainty about yields; and labor is still a major difficulty; it continues to be inadequate, and with growing industrialization here, improvement is not likely. Government interference is also a potential drawback.

Dr. Phelps shows why, although rubber planting may be economic for nationals in certain Latin American countries, it may not be desirable business for foreign concerns. At the same time, he points to the lack of progress in expansion of rubber cultivation by small farmers and suggests that the key to greater development in this direction would be the example of successful operation, for instance, of the new plantations started in Brazil by Firestone, Pirelli, and Goodyear; the latter's plan to grow rubber in Guatemala seems to be of particular interest in this respect, among others.

But even so, he finds there is no hope that Latin America will become self-sufficient in natural rubber in the foreseeable future. Nor is he very optimistic about early manufacture of synthetic rubber here because of the low level of demand and the negative attitude toward synthetic rubber in natural rubber centers. He sees no likelihood of heavy foreign investment in rubber expansion in Latin America to supply world

markets: there is still too much doubt whether rubber can be grown successfully here and at reasonable cost, as well as wariness of possible political instability and government interference.

"Experimental Designs." Second Edition. By Wm. G. Cochran and Gertrude M. Cox. Cloth covers, $6\frac{3}{16}$ by $9\frac{5}{16}$ inches, 630 pages. John Wiley & Sons, Inc., New York, N. Y. Price $10.25.

In the beginning Fisher created the analysis of variance and the z-distribution. The design of experiments was without form, and void; and darkness was upon the face of the experimenter. Enlightenment as to the use and wide applicability of the designed experiment and its analysis and interpretation first appeared in 1944 as a mimeographed manuscript from the authors' Statistical Laboratory at Iowa State College. Thirteen years, and two editions later, the experimenter is again fortunate in having "more light" thrown upon this most important phase of his scientific endeavor.

This second edition of "Experimental Designs" contains all of the attributes of the first edition plus much new and valuable information.

The book opens with a general discussion of the logic of experimentation (Chapters 1 and 2), followed by a brief, but thorough review of the basic theory and computations of the analysis of variance (Chapter 3), and then dives into the use and analysis (numerous detailed examples are given) of the many experimental designs in use today (Chapters 4 to 14).

Of special importance to industrial experimenters are the sections on factorial experiments, fractional replication of factorial experiments, split-plot designs, partially balanced incomplete block designs, and methods for the study of response surfaces (Box-Hunter designs).

This book, either in its first- or second-edition form, is the bread-and-butter bible of most practicing experimental statisticians and has served as the introductory "design course" for scores of students, both in statistics and other fields.

Other experimental design books are available, and undoubtedly more will be published; but we venture that after reading them, most people will return to Cochran and Cox to find out how it's done.

NEW PUBLICATIONS

"Vulcan 3 and Vulcan 6 in a Natural Rubber-Synthetic Rubber Blend for Truck Tire Treads." No. GD 21. By F. H. Amon, T. D. Bolt, and C. P. Louthan. Godfrey L. Cabot, Inc., Cambridge, Mass. 5 pages. A Cabot road test of truck tire treads has compared natural rubber with a 50/50 blend of natural rubber and cold SBR. One group of tires had whole treads containing 40 phr. Vulcan 6 in natural rubber, a type of tread which had given good performance in a previous road test (Report No. RS-103). As was shown in the report, less tread cracking developed with 40 phr. Vulcan 6 than with 48 phr. HAF black or 44 phr. EPC black. The second group of tires with NR/SBR blend treads had 40 phr. Vulcan 6 in one part tread and 44 phr. Vulcan 3 in another. The tread crack resistance with 40 phr. Vulcan 6 was better than with 44 phr. Vulcan 3 in the NR/SBR half treads.

"How to Strip Paint." Oakite Products, Inc., New York, N. Y. 8 pages. Four commonly used methods to remove paint are described in detail in this booklet and 12 different paint-stripping compounds are listed. This booklet also discusses treatment of metals before repainting, and prevention of rust on stripped surfaces in storage.

"Splicing Silicone Rubber." Bulletin No. U-9-100. Dow Corning Corp., Midland, Mich. 4 pages. This bulletin details how silicone rubber fabrications ranging from $\frac{1}{64}$-inch sheet to thick moldings can be spliced with Silastic Adhesive S-2200. Silastic S-2200 is said to bond well either to vulcanized silicone rubber or to vulcanized and oven-cured silicone rubber. The adhesive, however, needs a short oven cure at 480° F. in order to have best properties in high-temperature service. Procedures and illustrations for butt-splicing extrusions and sheets are given.

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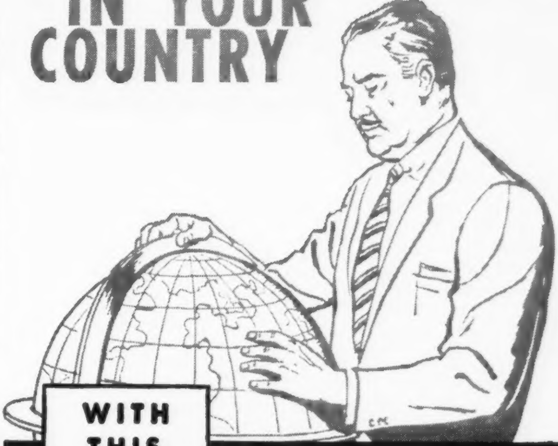

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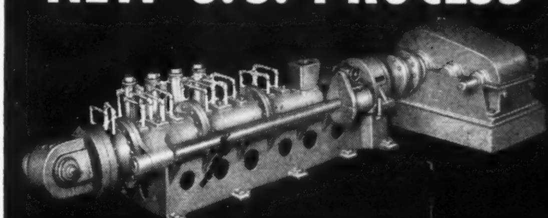

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Technical Books

Publications of the Shell Chemical Corp., Torrance, Calif.:

"Shell S-1502 in Sponge Backed Mats." SC:58-41. 2 pages. This data sheet describes the use of S-1502 both in the sponge backing and the cover stock in kitchen anti-fatigue mats. Compounding formulations, cures, and physical properties of both backing and cover are included.

"Shell S-Polymers in Conveyor Belt Covers." SC:58-42. 2 pages. This data sheet describes the use of S-1500 and S-1712 in conveyor belt cover stocks. When color or resistance to staining is important S-1502 and S-1707 are recommended in place of S-1500 and S-1712. Compounding formulations, cures, and physical properties are listed.

"Shell S-Polymers in Tread Rubber." SC:58-43. 2 pages. This data sheet gives the formulations of S-1500, a cold rubber, S-1712, an oil-extended rubber, and S-1600, a black masterbatch, all SBR copolymers, in various tread stocks. Cure and physical properties are covered.

"Shell S-1502 in Wire Insulation." SC:58-44. 1 page. Shell S-1502 stock is said to permit smooth extrusions, and the physical properties are reported to meet the national electrical code for RH-type insulation. A formulation, cure data, and physical properties of the vulcanizate appear.

"Shell S-1502 in Light-Colored Molded Goods." SC:58-45. 1 page. In non-black molded goods such as mats, basin stoppers, and toys, S-1502 is recommended as it is said to be highly resistant to discoloration, does not cause staining, and can absorb high loadings of selected mineral fillers. Formulations for a white basin stopper and a white mat are given as well as cure data, and the physical properties of the vulcanizates.

Publications of The Goodyear Tire & Rubber Co., chemical division, Akron, O. (Tech-Book Facts Bulletins):

"Formulating with Pliovic VO Dispersion Resin." No. 58-69. 3 pages. The specialized properties of Pliovic VO are developed for specific applications. Readily available plasticizers, stabilizers, fillers, etc., are combined with Pliovic VO in plastisol formulations, using stir-in mixing techniques. Compounds for rotocasting, metal coating, and dipping applications benefit from the outstanding shelf life, low viscosity, and good heat stability of Pliovic VO. Various formulations are suggested for evaluation in these applications.

"Plasticizers for Pliovic VO." No. 58-66. 12 pages. Low viscosity and excellent shelf-life are typical of plastisols formulated with Pliovic VO. Evaluation data show no significant viscosity increase after aging with 80 different plasticizers or plasticizer combinations. Included are highly solvating types often used because of their desirable properties. Listed are 66 plasticizers, their chemical composition, cost, and manufacturer.

"Anhydrous Ammonia." Technical Bulletin No. 52. Industrial products department, Sun Oil Co., Philadelphia, Pa. 2 pages. This bulletin on commercial and refrigeration grades of anhydrous ammonia contains information on physical-chemical properties, specifications, and the company's shipping and service facilities. A brief list of uses for anhydrous ammonia is included.

"Enjay Butyl for Appliance Applications." Bulletin No. 7. Enjay Co., Inc., New York, N. Y. 4 pages. This bulletin contains compounding and performance information on Enjay Butyl rubber for use in contact with typical household chemicals. Typical formulations designed for extruded and molded applications, such as washing machine hose, boots, gaskets, or functionally decorative parts, are also presented. Comparative test results are included.

"Richardson Model E-50 Automatic Bagging Scale." No. 3749B. Richardson Scale Co., Clifton, N. J. 6 pages. This bulletin describes and illustrates the company's E-50 automatic bagging scale, including its design, capacities, gravity or power feed operation, and discharge. Another feature is its high-speed net weighing of materials. This brochure also contains engineering drawings, illustrations of suggested feeding arrangements, and descriptions of accessories.

Publications of the elastomer chemicals department, E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.:

"An Aqueous Adhesive System for Bonding Elastomers to Synthetic Fibers." Report BL-338. C. H. Gelbert and G. E. Owen, Jr. 4 pages. Synthetic fiber cords or fabrics may be bonded to elastomers by using an isocyanate in either a solvent cement or latex adhesive. When an aqueous or latex system is desired, good results are obtained with a water stable blocked isocyanate Hylene MP, in Neoprene Latex Type 635. Such an adhesive is discussed in this bulletin. It is applicable to treatment of nylon or Dacron polyester fiber cords or fabrics for use in belting and coated fabrics.

"Neoprene Type AD—A New Neoprene for Quick-Setting Adhesive Cements." Report No. 58-1. J. H. Smuckler. 8 pages. Neoprene Type AD is a new neoprene for adhesive cements. Its outstanding characteristics are lighter original color, little color change at moderately elevated temperatures, and excellent stability with respect to viscosity of the neoprene and its solutions. In handling, adhesiveness, and developement of high bond strength, it is said to be similar to and fully the equal of Neoprene Type AC. Physical properties, aging tests and results, and compounding and curing information also are given.

"Viton A and Viton A-HV." Report No. 58-3. By A. L. Moran and T. D. Eubank. 36 pages. Viton A and Viton A-HV are copolymers of vinylidene fluoride and hexafluoropropylene which are said to have good moldability, low compression set, excellent resistance to severely deteriorating ester-type fluids, and, in particular, resistance to higher temperatures than other rubbers will withstand. This booklet describes raw polymer and vulcanizate properties, compounding ingredients, processing, molding and curing, and various applications of the two rubbers.

"How to Determine Stock Requirements for Tubing." Silicones Division, Union Carbide Corp., New York, N. Y. 4 pages. This data sheet contains a nomograph used to determine the quantity of silicone rubber compound required for production of tubing. The nomograph has been designed for rapid calculation of the amount of the company's silicone stock in one linear foot of either industrial tubing or military hot air ducting. Its use is applicable to any silicone rubber tube extrusion up to 14 inches in diameter with wall thicknesses from 40 to 150 mils. The nomograph theoretically computes an exact pound requirement.

"New Paracril Ozo Compound for HPN-Type Heater Cord." No. 219-B Revised. Naugatuck Chemical Division, United States Rubber Co., Naugatuck, Conn. 2 pages. This bulletin is a revision of No. 219 in which Compound 219-B was aged in test tubes and showed 210% elongation upon being aged 10 days at 121° C. Rerunning the test has shown the compound to have an adequate margin of safety on the aging test when the samples are exposed to the air in a full draft, circulating air oven, instead of being aged in test tubes. Compounding data, formulation, original physical properties, and test results are given in the revised bulletin.

"Summary of Current Literature. Index of Subjects for Five Years 1941 to 1945. Vols. 19 to 23." The Research Association of British Rubber Manufacturers, Shawbury, Shrewsbury, Shropshire, England. 102 pages. From 1946 onward name, patent, and subject indices to "Rubber Abstracts" (formerly "Summary of Current Literature") have been issued annually. Before that year only name and patent indices were made. Realizing that the usefulness in future years of this publication depends largely on its indices, an effort is being made to extend backward the period covered by the subject index, and this volume constitutes a cumulative index to Volumes 19 to 23, for the years 1941 to 1945 inclusive. This volume forms a comprehensive and detailed guide to the rubber literature of most of the World War II period.

"Recommended to Comply with Government Specifications." The Borden Chemical Co., New York, N. Y. 12 pages. This booklet lists all Borden chemical products recommended to comply with United States Government specifications. Included are adhesives, coatings, sealers and vinyl tubings, and others. The products are listed by type, with Borden brand names, and the specifications each meets.

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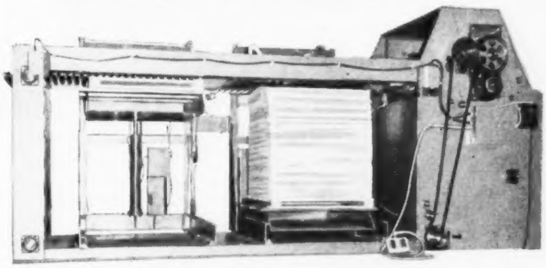

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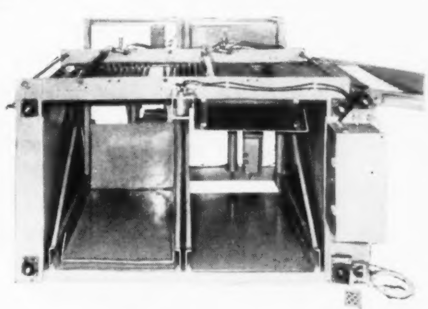

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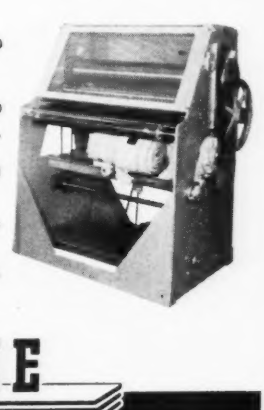

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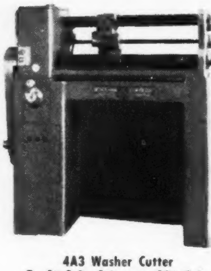

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Technical Books

"Applications of Velsicol Resins in Rubber Compounding." No. 218. Velsicol Chemical Corp., Chicago, Ill. 20 pages. Velsicol resins, essentially thermoplastic hydrocarbon materials, are linear polymers which function as plasticizers, softeners, and reinforcing agents. They are said to possess the electrical properties required of insulating materials. Stocks containing these resins exhibit good processing, calendering, and tubing properties. The physical and chemical properties of the resins are tabulated in this bulletin as well as the electrical properties. Formulations for various applications also are given.

"Allis-Chalmers TEFC Motors." Allis-Chalmers Mfg. Co., Milwaukee, Wis. 8 pages. The company's redesigned line of TEFC tube-type motors with capsule-mounted split-sleeve bearings are described. This bulletin portrays the motor's tube-type air-to-air heat exchanger system, bearing construction, frame, stator, and rotor construction. These motors are available in standard and explosion-proof designs in ratings from 40 hp. at 600 rpm. through 800 hp. at 3,600 rpm. and with capsule-mounted split-sleeve bearing for direct coupling or with cartridge-mounted ball or roller bearing for belt or chain drives.

"How to Handle Bromine." Michigan Chemical Corp., St. Louis, Mich. 35 pages. This booklet gives information on bromine such as types of hazards, accident prevention and protection, first aid, shipping information for bromine, and handling bromine in the laboratory and the plant.

"Seal of Approval Listing of Plastic Materials, Pipe, and Fittings for Potable Water Supplies." The National Sanitation Foundation, University of Michigan, Ann Arbor, Mich. 10 pages. This booklet lists the manufacturer, the general material, a code of materials, and the trade name or designation of the materials which are the results of a study of the suitability of plastic pipe for potable water supply use. It was indicated that manufacturers have agreed to use the common term acrylonitrile-butadiene-styrene or ABS for products previously so listed, and for products previously listed as acrylonitrile copolymer blends or ACB. Also cellulose acetate butyrate, CAB, has been dropped; and one new type of resin has been added, acrylonitrile-styrene, AS.

"Fact Book for Selecting Quad Ring Seals and O-Rings." Minnesota Rubber Co., Minneapolis, Minn. 16 pages. This new aid for rubber buyers and engineers contains information such as the size numbers and dimensions of all common industrial O-rings and the company's exclusive Rubber Quad Ring. These sizes are cross-indexed for easy comparison with many of the commonly used dimensional specifications. The book also includes quick reference charts covering Aeronautical Material Specifications, SAE-ASTM material specifications, Mil-R-5847C Specifications, U. L. approved rubber compounds, and many other useful facts concerning rubber.

"Static Power—Adjustable Speed Drives." Cutler-Hammer Inc., Milwaukee, Wis. 16 pages. The company, in its Ultraflex M and Ultraflex E packaged drives which are described in this brochure, has replaced the motor generator set with a static source of power utilizing the principle of a magnetic amplifier to provide smooth, readily adjustable direct current. As a part of the complete package, Cutler-Hammer combined this static power source with the latest types of industrial d-c motors. The new packaged drives are available in two forms—Ultraflex M and Ultraflex E.

"What SPE Can Do for You." The Society of Plastics Engineers, Inc., Greenwich, Conn. 16 pages. The brochure summarizes all the activities and benefits of SPE, an international scientific and educational organization devoted to the development and dissemination of technical information in the fields of research, design, development, production, and utilization of plastics materials. Application for joining SPE is enclosed.

"Banbury Mixers." Bulletin No. 207. Farrel-Birmingham Co., Inc., Ansonia, Conn. 36 pages. This booklet, containing some 60 illustrations, furnishes up-to-date information on the company's complete line of internal mixers including an introduction, varied applications, design and construction data, sizes, capacities, installation, and operation. Other topics include process engineering qualifications, process laboratory information, Banbury repair and rebuilding services, other F-B processing units, and information about where the mixers and other machines are made.

"Particle Accelerators." High Voltage Engineering Corp., Burlington, Mass. 12 pages. This two-color brochure describes the many and potential applications of both Van de Graaff and linear accelerators, utilizing photographs and line drawings to point up significant design and performance features. Three broad areas of applications for accelerators, as noted in the brochure, include basic scientific research, applied research and engineering, and engineering and production. Condensed specifications for the company's entire line of accelerators are provided in a table.

Publications of the United States Department of Commerce, Office of Technical Services, Washington, D. C.:

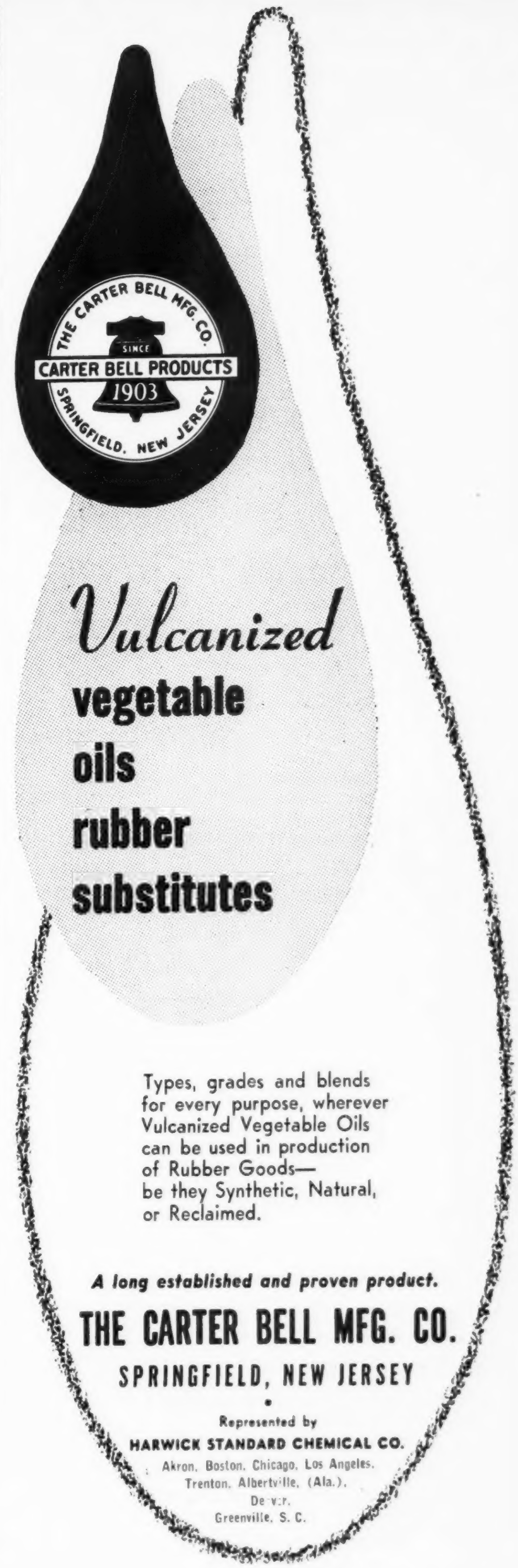
"Resistance of Plastics to Outdoor Exposure." Order PB 131331. R. B. Barrett, Picatinny Arsenal, U. S. Army Ordnance Corps. $6. 268 pages. This comprehensive guide gives weather resistance data and experimental results of tests on 72 different plastic materials for use in outdoor exposure. Special properties, formulations, applicable government specifications, and conditions of fabrication are presented.

"Investigation of Thermal Properties of Plastic Laminates, Cores, and Sandwich Panels. Part II." Order PB 121191. F. R. O'Brien and S. Oglesby, Jr., Southern Research Center for WADC, U. S. Air Force. $2. 79 pages. Thermal properties were measured for a selected group of plastic structural materials. The test materials were four laminates with #181 glass-fabric reinforcement, but with four different resins: three ½-inch thick, foamed-in-place alkyd-isocyanate plastic cores; one ½-inch thick, foamed-in-place heat-resistant plastic core; one foam sandwich panel; and one honeycomb panel. Properties measured included specific heat from 100 to 600° F., thermal conductivity, and coefficient of linear thermal expansion from –100 to 600° F.

"A Review of the Air Force Materials Research and Development Program." PB 111648S3. H. E. Hines, WADC, U. S. Air Force. $4.75. This volume contains abstracts of technical reports and notes written during the period July, 1956, through June, 1957, under the Air Force's materials research and development program. It is the fifth volume of a series which reviews the program since 1951. Two hundred and seventy reports are abstracted, covering research in adhesives, metallurgy, analysis and measurement, biochemistry, textiles, petroleum products, plastics, packaging, protective treatment, and rubber. Reports available to industry from OTS are so designated in the publication.

"A Study of the Effects of Nuclear Radiations on Elastomeric Compounds and Compounding Materials: Part II." J. W. Born, The B. F. Goodrich Co., for WADC, U. S. Air Force. Order PB 121705. September, 1956. 87 pages. $2.25. Screening was completed of promising radiation damage inhibitors (Anti-Rads) for elastomeric compounds and compounding ingredients discovered during the first phase of research. Ninety-one Anti-Rads were compounded, cured, and irradiated in preparation for physical tests designed to uncover the most effective chemical structures for inhibition of radiation deterioration. Fundamental information about radiation damage was provided by stress relaxation and volume swell measurements, infrared absorption analyses, and mass spectral analyses.

"Electrical Properties of Irradiated Polymers." R. E. Woodard, WADC, U. S. Air Force. Order PB 131254. June, 1957. 32 pages. $1.00. The effects of nuclear radiation on the electrical properties of polymers were examined as part of efforts to develop improved engineering materials for nuclear powered aircraft and supersonic vehicles. The theory of nuclear radiation is reviewed, and the role played by nuclear radiation in polymer kinetics is discussed. The change produced in the dielectric constant of an irradiated polymer is considered in terms of cross-linking and dipole moments. Included is a survey of available engineering data for irradiated polymers.



MARKET REVIEWS

Natural Rubber

During the May 16-June 15 period, the New York natural rubber market witnessed a little more interest, which for the most part took the shape of covering and some desultory buying by dealers. Toward the end of May the market had risen $1\frac{1}{8}$-$1\frac{3}{8}$¢ for the top three grades of RSS, but RMA-3 Blankets trailed behind with a ½¢ gain. This made them a more attractive buy, and with more offers from the East, factories stepped in, and their appearance as buyers touched off stop-loss covering just before the long Memorial Day week-end.

During early June natural rubber prices were under pressure, induced by reports from Indonesia that the government there was planning to issue licenses for large quantities of lower grades of rubber. Since tire manufacturers buy fair quantities of the lower grades, the prices were adversely affected, it was reported.

Although the Indonesian political situation has lost its market influence, conditions there are by no means peaceful, and mopping-up operations are still proceeding accompanied by arrests of some officials and disappearances of others. From Northern Sumatra it is reported that some estates have suffered damage during the operations there.

May sales, on the New York Commodity Exchange, amounted to 9,620 tons, compared with 9,610 tons for April contract. There were 21 trading days in May and 19 during the May 16-June 15 period.

REX CONTRACT

	May 23	May 29	June 6	June 13
1958				
May	25.60	26.60	25.77	26.14
July	25.80	26.48	25.75	26.10
Sept.	25.75	26.30	25.75	26.05
Nov.	25.70	26.23	25.70	26.00
1959				
Jan.	25.70	26.15	25.70	25.95
Mar.	25.65	26.15	25.70	25.94
May	25.65	26.15	25.70	25.94
Total weekly sales, tons	1,750	1,540	1,230	670

On the physical market, RSS #1, according to the Rubber Trade Association of New York, averaged 25.91¢ per pound for the May 16-June 15 period. Average May sellers' prices for representative grades were: RSS #3, 23.34¢; #3 Amber Blankets, 20.67¢; and Flat Bark, 18.52¢.

NEW YORK OUTSIDE MARKET

	May 23	May 29	June 6	June 13
RSS #1	25.27	26.50	25.88	26.13
2	24.28	25.63	25.00	25.38
3	23.50	24.38	23.75	24.00
Pale Crepe				
#1 Thick	27.50	28.50	28.25	28.75
Thin	27.50	28.50	28.25	28.75
#3 Amber Blankets	20.75	21.13	20.75	20.88
Thin Brown Crepe	19.75	19.75	19.75	19.88
Standard Bark Flat	18.50	18.75	18.50	18.50

Synthetic Rubber

In spite of the business slowdown of the past few months, consumption of new rubber and particularly synthetic rubber has held up remarkably well. New rubber consumption in the United States during May amounted to 100,752 long tons, compared with the April consumption of 103,221 tons, according to the regular monthly report of The Rubber Manufacturers Association, Inc.

Consumption of synthetic rubber in May amounted to 65,313 tons, compared with the 66,613 tons used in April, and this consumption has remained in the 65,000-ton area throughout the months of March, April, and May.

Consumption of synthetic rubber by types, in tons, in May, compared with April was as follows: SBR, 54,719, against 55,133; neoprene, 4,613, against 4,962; butyl, 4,179, against 4,621; and nitrile, 1,802 against 1,897.

The production of synthetic rubbers in May in tons was 76,438, as compared with the 73,757 tons made in April; the major portion of this increase was SBR, which rose to 62,170 tons in May, as compared with 59,263 in April.

Exports of synthetic rubber also were higher in May at 17,325 tons, against 16,950 in April; the major factor again was SBR, which went from 12,750 tons in April to 13,200 tons in May.

Activities in synthetic rubber during May therefore might be summed up as follows: consumption down, but not badly; production somewhat higher; and exports holding up well. The summer plant shutdowns for vacations will slow production and consumption, but business activity after Labor Day is expected to be more satisfactory than earlier this year.

Latex

During the May 16-June 15 period, conditions in the liquid latex market have generally remained quiet, and apart from a few fairly large orders for current shipment inquiries for nearby latex have been on a modest scale and rather scattered.

It was reported that interest in forward shipment, however, has been more pronounced, which perhaps can be taken as an encouraging sign as it seems to confirm that while manufacturers are living for the moment on their existing stocks some feel that the present price level and differential are sufficiently attractive and safe to plan ahead. Buying interest in bulk latex is said to be at a low ebb, and the differential has narrowed slightly, but no abnormal selling pressure has been evident.

Prices for ASTM Centrifuged Concentrated natural latex, in tank-car quantities, f.o.b., rail tank car ran about 33.84¢ per pound solids. Synthetic latices prices were 22.5 to 31.2¢ for SBR; 37 to 55¢ for neoprene; and 46 to 65¢ per pound for the nitrile types.

Final March and preliminary April domestic statistics for all latices were reported by the United States Department of Commerce as given in the tabulation below:

(All Figures in Long Tons, Dry Weight)

Type of Latex	Production	Imports	Consumption	Month-End Stocks
Natural				
Mar.	0	....	5,560	16,825
Apr.	0	....	4,847	17,415
SBR				
Mar.	4,880	—	4,708	7,991
Apr.	3,889	—	4,093	7,756
Neoprene				
Mar.	759	0	633	1,281
Apr.	907	0	707	1,398
Nitrile				
Mar.	787	0	720	1,974
Apr.	830	0	797	1,744

Reclaimed Rubber

Although the usual seasonal drop-off in the use of reclaimed rubber is expected during the summer months it was reported by one reclaimer that business continued to show some pick-up between May 16 and June 15. Indications were that June was a very good month for the reclaimed business.

CYANAMID RUBBER Chem Lines

NO. 17 OF A SERIES Published by AMERICAN CYANAMID COMPANY, Rubber Chemicals Department, Bound Brook, New Jersey

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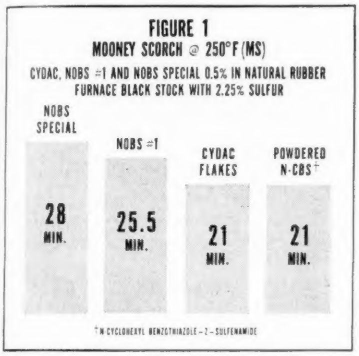
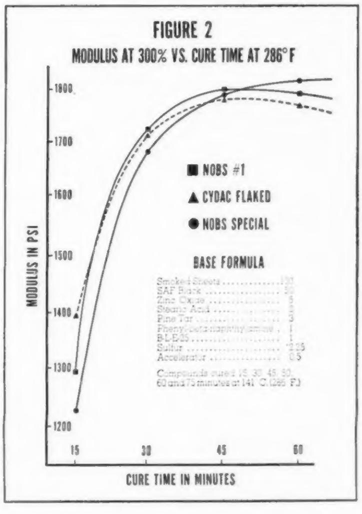
Cydac® Accelerator Flaked





CYDAC Accelerator Flaked is a completely new and economical form of N-cyclohexyl benzothiazole-2-sulfenamide, for many years one of the rubber industry's most popular delayed action accelerators. In processing safety, it fills out the mid-activity range between Cyanamid's well-known MBTS and NOBS* delayed action accelerators.

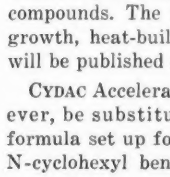
In the new flake form developed by Cyanamid, this valuable chemical now adds to its other properties the advantages of outstanding ease of handling, freedom from caking and bridging in automatic weighing equipment, and elimination of dusting problems common to powdered accelerators.

CYDAC consists of small, free-flowing flakes which impart no color to white or light-colored stocks, either cured or uncured. CYDAC disperses readily under ordinary mixing conditions at temperatures as low as 150°F. A typical melting range is 203-212°F. Specific gravity is approximately 1.25.

Performance of CYDAC Flaked is identical to powdered forms of N-CBS during cure. Figure 1 shows a comparison of Mooney Scorch values for these grades with Cyanamid's NOBS* #1 and NOBS* Special accelerators in a natural rubber stock. In Figure 2, the development of cure properties is shown.

A full program of laboratory tests is now being conducted to obtain data on CYDAC's performance in a variety of compounds. The results of these cut-growth, heat-buildup and aging tests will be published shortly.

CYDAC Accelerator Flaked may, however, be substituted directly in any formula set up for powdered forms of N-cyclohexyl benzothiazole-2-sulfenamide. Further details of this valuable addition to the mid-activity range may be obtained from your Cyanamid Rubber Chemicals representative, or direct from American Cyanamid Company, Rubber Chemicals Department, Bound Brook, N. J.



CYDAC Flaked flows freely—even through a laboratory funnel.

Stabilizer 46-33

Emulsion-polymerized butadiene styrene copolymers of the general purpose type require the presence of a stabilizer during finishing and storage. The stabilizer prevents polymer cross-linking or gel formation while the polymer is being dried and during its warehouse or plant storage time. The tendency toward gel formation is also present during the mastication or mixing operations when SBR is processed. The stabilizer used in the manufacture of SBR should also be effective in preventing the gel build-up during this mixing operation.

The stabilizing action of amine-type antioxidants in SBR polymers has been quite satisfactory. However, their staining characteristics have limited their use. In white or light-colored stocks it has been necessary to replace them with non-staining types such as styrenated phenols or alkyl aryl phosphites which are relatively weak in their stabilizing action.

Cyanamid's Stabilizer 46-33 combines freedom from color problems with an activity similar to that of the staining amine-type stabilizers. The activity of Stabilizer 46-33 is due to 2,2′-methylene-*bis* (4-methyl-6-tertiary butylphenol) which has already found extensive use in the field of rubber compounding as ANTIOXIDANT® 2246. Maximum storage stability and superior inhibition of gel formation can now be realized with non-staining SBR polymers protected by Stabilizer 46-33.

A new Special Report on Stabilizer 46-33 is now available from American Cyanamid Company's Rubber Chemicals Department, Bound Brook, New Jersey. Write for your copy.

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MBTS PELLETS

Free-flowing MBTS Pellets eliminate dusting problems, avoid weighing losses, cut storage requirements, reduce handling costs. Safe, non-scorching and with a long curing plateau, MBTS Pellets give 100% value for every ounce. Write Cyanamid for details.

Market Reviews

During this period there was a flurry in the automotive industry which gave original-equipment sales of tires a surge. This did not cut the high level of sales in replacement tires, and the additive effect was a sharp increase in the use of reclaimed rubber. The activity continued throughout June, but was expected to die down with the vacation shutdown. A large number of companies are choosing the first two weeks of July this year for a shutdown; so July business is expected to be sharply down.

The fact that reclaimed rubber felt this effect of increasing tire building so quickly augurs well for this raw material. It indicates that compounders still recognize the need of reclaimed rubber to build tires.

According to The Rubber Manufacturers Association, Inc., report, May production of reclaimed rubber reached 19,100 tons; while consumption was 20,500 long tons.

Reclaimed Rubber Prices

Whole tire, first line	$0.115
Third line	.11
Inner tube, black	.16
Red	.21
Butyl	.14
Light carcass	.22
Mechanical, light-colored, medium gravity	.155
Black, medium gravity	.085

The above list includes those items or classes only that determine the price basis of all derivative reclaim grades. Every manufacturer produces a variety of special reclaims in each general group separately featuring characteristic properties of quality, workability, and gravity, at special prices.

Scrap Rubber

There was a dearth of encouraging news in the scrap rubber market during the period under review, and, apparently, few factors had been anticipating such developments. Trading in recent weeks has been extremely slow and the immediate outlook was not bright, it was reported. The reclaimer at Naugatuck continued its policy of working off its own scrap inventories, and it was not accepting any mixed auto tires.

The situation in tubes was little better, with only sporadic sales noted. Prices, despite the lack of trading, were unchanged with the Eastern auto tire price applicable only on shipments to Buffalo.

	Eastern Points	Akron, O.
	Per Net Ton	
Mixed auto tires	$11.00	$12.00
S. A. G. truck tires	nom.	15.50
Peeling, No. 1	nom.	23.00
2	nom.	20.00
3	nom.	15.50
Tire buffings	nom.	nom.
	(¢ per Lb.)	
Auto tubes, mixed	2.50	2.75
Black	6.25	6.25
Red	6.25	6.25
Butyl	3.50	3.625

Industrial Fabrics

Increased activity continued in wide industrial fabrics during the period under review. In general, selling prices were better, although the quotation prices have been nominal for some time. Mills have been cautious and have followed a trend of unloading inventories.

The automotive industry has been making some demands for wide drills, broken twills, certain sateens, and coating fabrics in general. While business actually has not been good, small quantities of orders have been coming through. According to one source, a better tone in the industrial fabrics market has appeared and is expected to carry on as new demands arise.

Industrial Fabrics

Broken Twills*			
54-inch, 1.14, 76x52	yd.		$0.52
58-inch, 1.06, 76x52			.56
60-inch, 1.02, 76x52			.5825
Drills*			
59-inch, 1.85, 68x40	yd.		.33
2.25, 68x40			.29
Osnaburgs*			
40-inch, 2.11, 35x25	yd.		.2275
3.65, 35x25			.1525
59-inch, 2.35, 32x26			.26
62-inch, 2.23, 32x26			.275
Ducks			
Enameling Ducks*		S. F.	D. F.
38-inch, 1.78 yd.		$0.3263	.3313
2.00 yd.		.295	.30
51.5-inch, 1.35 yd.		.43	.445
57-inch, 1.22 yd.		.4838	.50
61.5-inch, 1.09 yd.		.5413	.5538
Army Duck†			
52-inch, 11.70 oz., 54x40 (8.10 oz./sq. yd.)	yd.		.5925
Numbered Duck**			
List less 40%			
Hose and Belting Duck*			
Basis	lb.		.63
Sheeting*			
40-inch, 3.15, 64x64	yd.		.2175
3.60, 56x56			.185
52-inch, 3.85, 48x48			.2275
57-inch, 3.47, 48x48			.24
60-inch, 2.10, 64x64			.36
2.40, 56x56			.31
Sateens*			
53-inch, 1.12, 96x60	yd.		.57
1.32, 96x64			.525
57-inch, 1.04, 96x60			.615
58-inch, 1.02, 96x60			.6275
1.21, 96x64			.5725
Chafer Fabrics*			
14.40-oz./sq. yd. P.Y.	yd.		.73
11.65-oz./sq. yd. S.Y.			.61
10.80-oz./sq. yd. S.Y.			.6575
8.9-oz./sq. yd. S.Y.			.67
40-inch, 2.56, 35x25			.25
60-inch, 1.71, 35x25			.435

*Net 10 days.
†2% 10 days.

Rayon and Nylon

Total packaged production of rayon and acetate filament yarn during May was 49,200,000 pounds, consisting of 18,600,000 pounds of high-tenacity rayon yarn and 30,600,000 pounds of regular-tenacity rayon yarn. For April, production had been: total, 47,900,000 pounds, including regular-tenacity rayon yarn, 29,000,000; high-tenacity rayon yarn, 18,900,000 pounds.

Filament yarn shipments to domestic consumers for May totaled 48,500,000 pounds, of which 17,100,000 pounds were high-tenacity rayon yarn and 31,400,000 were regular-tenacity rayon yarn. April shipments had been: total, 46,700,000 pounds; high-tenacity, 16,800,000 pounds; regular-tenacity, 29,900,000 pounds.

Stocks on May 29 totaled 69,600,000 pounds, made up of 20,000,000 pounds of high-tenacity rayon yarn and 49,600,000 pounds of regular-tenacity rayon yarn. End-of-April stocks had been: total, 69,900,000 pounds; high-tenacity rayon yarn, 19,000,000 pounds; regular-tenacity yarn, 50,900,000 pounds.

A price reduction was announced by two leading nylon producers on heavy nylon yarns both for tire cord and other uses. Prices effective immediately, were cut 10¢ a pound on the 840 denier and 1680 denier nylon tire yarns; while prices of other heavy denier industrial nylon yarns were reduced 7-9¢ a pound.

A number of observers in the tire field expressed the opinion that the nylon price cut was not unexpected in view of the increased nylon capacity. Some of them, however, believe that in order for nylon to become fully competitive with rayon tire cord, a reduction of at least 20% from its former $1.30 level is necessary. The 10¢-a-pound price cut is well short of this, but is considered a step in the right direction.

The nylon tire yarn price cut also may have been spurred, it is believed, by a sharp drop in nylon tire cord output which took place in the first quarter. In that period, nylon cord output fell off 26%, compared to about 4% for rayon cord.

The reduction in nylon tire cord brings the price of the 840 denier, 140 filament, down to $1.20 a pound; the 1680 denier, 280 filament to the same level. In comparison, the 1650 denier rayon cord is priced at 58¢ a pound, and the 1100 denier at 63¢.

Rayon Prices

Tire Fabrics

1100/490/2	$0.69 /$0.73
1650/908/2	.63 / .725
2200/980/2	.625/ .655

Tire Yarns

High-Tenacity		
1100/ 490, 980	.50/	.64
1100/ 490	.59/	.63
1150/ 490, 980	.59/	.63
1165/ 480	.99/	.65
1230/ 490	.59/	.63
1650/ 720	.55/	.58
1650/ 980	.55/	.58
1875/ 980	.55/	.58
2200/ 960	.54/	.57
2200/ 980	.54/	.57
2200/1466		.64
4400/2934		.60
Super-High Tenacity		
1650/ 720		.58
1900/ 720		.58

Nylon Prices

Tire Yarns

840/ 140	$1.10/$1.20
1680/ 280	1.20

(*Continued from page 622*)

Output of rubber manufactures, including asbestos goods, declined from 31,460 tons in 1955 to 28,833 tons in 1956, as a result of the invasion of plastics into hitherto purely rubber fields, but more particularly because of the pressure of imports. In 1956, Austria exported 1,307.5 tons of automobile tires and 96 tons of automobile tubes, but imported 1,019 tons of tires and 73 tons of tubes. The early months of 1957 had better figures for output and exports of tires; in the first quarter of the year, Austria exported 440.7 tons of automobile tires (that is at a rate of more than 1,600 tons a year), but imports also rose, to 320.4 tons for the quarter (or more than 1,200 tons for a year).

India

India is to have a new tire factory, to be established jointly by Ceat S.P.A., an Italian concern, and the Tata company, the latter announced recently in Bombay, India. The new company, to be known as Ceat Tires of India, will have an authorized capital of 11,500,000 rupees, 60% of which will be provided by the Italian company and the remaining 40% by the Indian public.

India is reportedly embarked on a relatively heavy program of automobile and cycle production; cars are already being shipped to neighboring countries.

Netherlands

Europak 1959, the Fifth Netherlands Packaging Exhibition, is to be held in Amsterdam, April 21-29, 1959, when the newest packaging machines and materials from all parts of the world are to be on view. Lectures on prepackaging perishable foods, especially vegetables and fruits, are planned, and films and samples will be shown. Study groups are to be invited, and an information center arranged.

The Netherlands packaging exhibitions have been held in alternate years since 1951 and have become the largest of their kind in Europe, so that it was decided to give the coming exhibition the name of Europak 1959.

Sarawak

A sudden rise in the rubber exports from Sarawak in December, reduced the difference between 1957 and 1956 shipments to 229 tons, and final figures for the two years came to 41,003 tons and 41,232 tons respectively.

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Each drying section, or any arrangement of groups of sections, can be zoned and controlled independently to provide widest possible variation of temperature, humidity, etc., where needed. Production technique and settings are determined accurately, transferred to the production dryers without need for adjustment. Additional sections are added easily and quickly at your plant. They are delivered as a complete unit with motor, fan, heating coils and conveyor in place. Compact, made in two sizes, the smaller being only 4'-0" high and 3'-9" wide. Uses gas, electricity or steam for heating element. Simple adjustment to regulate conveyor speed. Fully instrumented, has all necessary controls and recording charts. It's a little giant of versatility — invaluable in the modern, cost-conscious pilot plant. Let us give you details.

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HOUSTON 17, TEX. — The Alpha Engineering Co., Box 12371
CHARLOTTE, N.C. — W. S. Anderson, Carolina Specialty Co.
ATLANTA, GA. — J. R. Angel, Mortgage Guarantee Building
TORONTO 1, CAN. — Hugh Williams & Co., 27 Wellington St. East

Synthetic Rubbers and Latices*

Monomers

11-80, 100, 200, 112-3 Triols	*lb.*	$0.255
11-300	*lb.*	.265
11-400	*lb.*	.325
Acrylonitrile	*lb.*	.27
Butadiene	*lb.*	.15
Dow Styrene N99, H99	*lb.*	.205
RG	*lb.*	.17
Vinyltoluene	*lb.*	.17
EGD	*lb.*	1.75 / $2.00
Hylene M	*lb.*	1.75 / 3.25
M-50	*lb.*	1.00 / 2.50
T	*lb.*	1.10 / 2.65
TM	*lb.*	.95 / 2.50
-65	*lb.*	1.00 / 2.55
Isobutylene	*gal.*	.38
Isoprene	*lb.*	.25
Mondur-C	*lb.*	1.05
Monomer MG-1	*lb.*	1.00 / 1.25
-S	*lb.*	.85
MPL	*lb.*	1.75 / 2.00
Multron R-2	*lb.*	.54
P200	*lb.*	.23
Rohm & Haas ethyl acrylate	*lb.*	.34 / .36
Glacial methacrylic acid	*lb.*	.45 / .47
Methyl acrylate	*lb.*	.37 / .39
Methacrylate	*lb.*	.29 / .31

Shortstops

DDM	*lb.*	.88 / .915
Mercaptan 174	*lb.*	.38 / .50
Sharstop	*lb.*	.33 / .37
268	*lb.*	.52 / .53
Tecquinol	*lb.*	.825 / .845
Thiostop K	*lb.*	.50 / .53
N	*lb.*	.38 / .47
Vulnapol KM	*lb.*	.52 / .53
NM	*lb.*	.38 / .42
Wingstop B	*lb.*	.38

Acrylic Types

Acrylon BA-15	*lb.*	1.25[a]
EA-5	*lb.*	1.00[a]
Hycar 4021		1.34[c] / 1.35[c]

Fluorocarbon Types

Kel-F Elastomer	*lb.*	15.00 / 16.00
5500, 820 (Latex)	*lb.*	15.00 / 17.15
Viton A, AHV	*lb.*	15.00

Isobutylene Types

Enjay Butyl 035, 150, 215, 065 217, 218,...	.23[a]
325, 165, 265, 267, 268, 365	.24[a]
Hycar 2202	.65[c] / .75[c]
Polysar Butyl 100, 200, 300, 400	.245[c]
101	.2775[a]
301	.255[c]
Vistanex LM	.45[a]
MM	.35[a]

Neoprene Types (CR)

Neoprene Type AC, AD, CG	.55[a]
GN, GN-A, WX	.41[a]
GRT, S	.42[a]
KNR	.75[a]
W, WHV	.39[a]
WRT	.45[a]

Latices

Neoprene Latex 571, 842-A	.37[a]
572	.39[a]
60, 601-A	.40[a]
635	.41[a]
650	.42[a] / .53[a]
735, 736	.38[a]
750	.39[a] / .50[a]
950	.47[a]

Nitrile Types

Butaprene NAA	.54[a]
NF	.49[a]
NL	.50[a]
NXM	.58[a]
Chemigum N1	.64[b]
N3 N5	.58[b]
N6, N-6B, N7, N8	.50[b]
Hycar 1001, 1041	.58[c] / .59[c]
1002, 1042, 1043, 1052, 1053, 1312	.50[c] / .51[c]
1014	.60[c] / .61[c]
1072	.64[c] / .65[c]
1411	.62[c] / .63[c]
1432, 1441	.59[c] / .60[c]
Paracril AJ	.485[c]
B, BJ, BJLT, BLT	.51[c]
C, CLT	.59[c]
CV	.60[c]
D	.65[c]
18-80	.60[c]
Polysar Krynac 800, 802, 803	.50[c]
801	.58[c]

Latices

Butaprene N-300	.46[b]
N-400, N-401	.54[b]

Chemigum 200	$0.49[b]
235 CHS, 236	.54[b]
245 B, 245 CHS, 246, 247, 248	.46[b]
Hycar 1512, 1552, 1562, 1577	$0.46[c] / .52[c]
1551, 1561, 1571	.54[c] / .60[c]
1852	.46[c] / .52[c]
Nitrex 2612, 2614	.46[a]
2615	.51[a]

Polyethylene Type

Hypalon 20, 30	*lb.*	.70

Polysulfide Types

Thiokol LP-2, -3, -31, -32, -33	.96[a]
-8	1.35[a]
PR-1	.95[a]
Type-A	.50[a]
FA	.69[a]
ST	1.25[a]

Latices

Thiokol Latex (dry wt.)	
Type MX	.80[a]
WD-2	1.25[a]
-6	.80[a] / 1.25[a]

Silicone Types

GE (compounded)	2.25[c] / 4.10[c]
Silicone gum (not compounded)	3.85[b] / 4.90[c]
Silastic (compounded)	2.95[b] / 3.50[b]
(Partly compounded)	3.15[b] / 3 60[b]
(Uncompounded)	4.35[b] / 4.35[b]
Union Carbide (compounds)	2.35[b] / 3.20[b]
(Gums)	3.85[b] / 4.25[b]

Styrene Types

Hot SBR‡

Amperipol 1000, 1001, 1006, 1007	.241[c] / .247[c]
1006 Crumb	.2475[c] / .2535[c]
1002	.2435[c] / .2495[c]
1009	.2475[c] / .2535[c]
1011	.2475[c] / .2610[c]
1012	.2425[c] / .2485[c]
Crumb	.254[c] / .26[c]
1013	.25[c] / .2560[c]
ASRC 1001, 1004, 1006, 1009	.241[c] / .2475[c]
1018	.270[c]
1019	.265[c]
FR-S 1000, 1001, 1004, 1006	.241[c] / .247[c]
1009	.2475[c] / .2535[c]
1010	.26[c] / .266[c]
1012	.2425[c] / .2485[c]
1013	.25[c] / .256[c]
1014	.281[c] / .287[c]
1015	.291[c] / .297[c]
Naugapol 1016, 1019	.265[b]
1018	.27[b]
1021	.30[b]
1022	.28[b]
1023	.285[b]
Philprene 1000, 1001, 1006	.241[b]
1009	.2475[b]
1010	.26[b]
1018	.27[b]
1019	.265[b]
Plioflex 1006	.241[c]
Polysar S, S-50	.241[c]
S-X-371	.255[c]
S-1001, -1006, -1013	.23[a]
-1002, -1011	.2325[a]
-1009	.24[a]
Synpol 1000, 1001, 1006, 1007, 1061	.241
1002	.2435[b]
1012	.2425[b]
1009	.2475[b]
1013	.25[b]

Hot SBR Black Masterbatch

Philprene 1100	.194
1104	.190[b]
S-1100	.185[a]

Cold SBR

Ameripol 1500, 1501, 1502	.241[c] / .247[c]
ASRC 1500, 1502	.241[c]
1503	.2625[c]
Copo 1500, 1502	.241[c] / .247[c]
1505	.261[c] / .267[c]
FR-S 1500, 1502	.247[c]
Naugapol 1503	.2625[b]
1504	.295[b]
Philprene 1500, 1502	.241[b]
1503	.2625[b]
Plioflex 1500, 1502	.241[c]
Polysar Kryflex 200	$0.251[c]
SS-250, SS-250-Flake	.2875[c]
Krylene, NS	.241[a]
S-1500, S-1502-S	.23[a]
S-1506	.25[a]
Synpol 1500, 1502, 1551	.241[b]

Cold SBR Black Masterbatch

Baytown 1600, 1601, 1602	.193[b]
Philprene 1600, 1601	.193[b]
1605	.19[b]
S-1600, -1601, -1602	.1825[a]

Cold SBR Oil Masterbatch

Ameripol 1703	$0.206[c] / .212[c]
1705	.2035[c] / .2095[c]
1707, 1708	.191[c] / .197[c]
1710, 1712	.1885[c] / .1945[c]
ASRC 1703	.206[c]
1708	.191[c]
Copo 1712	.1885[c] / .1945[c]
1773	.206[c] / .212[c]
1778	.191[c] / .197[c]
FR-S 1703	.206[c] / .212[c]
1705	.2035[c] / .2095[c]
1712	.1885[c] / .1945[c]
Philprene 1703	.206[b]
1706	.203[b]
1708	.191[b]
1712	.1885[b]
Plioflex 1703, 1773	.206[c]
1710, 1712	.1885[c]
1778	.191[c]
Polysar Krynol 65	.1885[c]
652	.191[c]
S-1703	.195[a]
1706	.1925[b]
-1707	.18[a]
-1709, -1712	.1775[a]
Synpol 1703	.206[b]
1707, 1708	.191[b]
1711	.19[b]
1712	.1885[b]

Hot SBR Latices

FR-S 2000, 2001	.2725[c] / .3425[c]
2002, 2003, 2004	.35[c] / .36[c]
2006	.29[c] / .382[c]
Naugatex 2000, 2001, 2006	.263[a]
2002	.288[a]
2005	.30[a]
Pliolite Latex 2000, 2001	.2825[c]
2076	.295[c]
Polysar Latex II	.29[c]
IV	.2775
S-2000	.2275[a]
2006	.215[a]

Cold SBR Oil-Black Masterbatch

Baytown 1801	.176[b]
Philprene 1803	.174[b]
S-1803	.165[a]
-1804	.175[a]

Cold BR Latex‡

Copo 2101, 2108	.30[c] / .4025[c]
2102, 2105, 2110	.32[c] / .3725[c]
FR-S 2105	.366[c]
Naugatex 2101	.285[a]
2105	.312[a]
X-767	.323[a]
Polysar Latex 721	.32[c]
Pliolite Latex 2101	.30[c]
2105, 2107	.32[c]
2108	.30[c]
S-2101	.225
-2105	.31[a]
-2107	.32[a]

Cold BR Latex‡

Pliolite Latex 2104	.325[c]

* Prices are per pound carload or tank-car dry weight unless otherwise specified.
[a] Freight extra.
[b] Minimum freight allowed.
[c] Freight prepaid.
‡SBR —Styrene-butadiene rubber.
§BR —Butadiene rubber.

•

Goodrich-Gulf Chemicals, Inc., Cleveland, O., has announced a million-dollar expansion of production facilities at its synthetic rubber plant in Institute W. Va. The expansion will increase the plant's production of crumb rubber, a product being used by manufacturers of cements, mastics, and adhesives. An extruder dryer for production of high-quality extrusion-dried electrical-grade rubbers and other special polymers will also be installed. The construction is scheduled for completion by September 1, and the extruder dryer will be installed by late October.

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Compounding Ingredients*

Abrasives

Pumicestone, powdered	lb.	$0.0363 /	$0.065
Rottenstone, domestic	lb.	.03 /	.04
Shelblast	ton	80.00 /	165.00
Walnut Shell Grits	ton	50.00 /	160.00

Accelerators

A-1 (Thiocarbanilide)	ton	.50 /	.57
A-32	ton	.66 /	.80
A-100	lb.	.52 /	.66
Accelerator 49		.59 /	.60
52	lb.	1.14	
57, 62, 67, 77	lb.	1.04	
66	lb.	4.25	
89	lb.	1.20	
108	lb.	.92 /	.97
552	lb.	2.25	
808	lb.	.66 /	.68
833	lb.	1.17 /	1.19
Altax	lb.	.54 /	.56
Arazate	lb.	2.25 /	2.30
Beutene	lb.	.66 /	.71
Bismate	lb.	3.00	
B-J-F	lb.	.27 /	.32
Butasan	lb.	1.04	
Butazate	lb.	1.04 /	1.09
Butyl Accelerator Eight	lb.	1.35	
Namate	lb.	.45 /	.50
Zimate	lb.	1.04	
Ziram	lb.	.89 /	1.04
Captax	lb.	.44 /	.46
C-P-B	lb.	1.95 /	2.00
Cumate	lb.	1.45	
Dibs	lb.	.85	
Diesterex N		.50 /	.57
Dipac	lb.	.85	
DOTG (diorthotolylguanidine)			
Cyanamid	lb.	.64 /	.65
Du Pont	lb.	.62 /	.63
DPG (diphenylguanidine)			
Cyanamid	lb.	.49 /	.50
Monsanto	lb.	.52 /	.58
El-Sixty	lb.	.62 /	.64
Ethasan	lb.	1.04	
Ethazate	lb.	1.04 /	1.09
50-D	lb.	.87 /	.92
Ethyl Seleram	lb.	3.00	
Thiurad	lb.	1.04	
Thiram	lb.	1.04	
Tuads	lb.	1.04	
Tuex	lb.	1.04 /	1.09
Zimate	lb.	1.04	
Ziram	lb.	.89 /	1.04
Ethylac #650	lb.	.93 /	.95
Guantal	lb.	.60 /	.67
Hepteen	lb.	.44 /	.50
Base	lb.	1.85 /	1.90
Ledate	lb.	1.04	
MBT (2-mercaptobenzothiazole)			
American Cyanamid	lb.	.44 /	.46
Du Pont	lb.	.42 /	.44
Naugatuck	lb.	.44 /	.49
-XXX, Cyanamid	lb.	.55 /	.57
MBTS (mercaptobenzothiazyl disulfide)			
Cyanamid	lb.	.54 /	.56
Du Pont	lb.	.52 /	.54
Naugatuck	lb.	.54 /	.59
-W Cyanamid	lb.	.59 /	.61
Merac #225	lb.	.75 /	1.05
Mertax	lb.	.55 /	.57
Methasan	lb.	1.04	
Methazate	lb.	1.04 /	1.09
Methyl Thiram	lb.	1.14	
Tuads	lb.	1.14	
Zimate	lb.	1.04	
Monex	lb.	1.14 /	1.19
Mono-Thiurad	lb.	1.14	
2-MT (2-mercaptothiazoline)			
Cynamid	lb.	.88 /	.90
Du Pont	lb.	1.00	
NOBS No. 1	lb.	.76 /	.78
Special	lb.	.80 /	.82
O-X-A-F	lb.	.55 /	.60
Pennac SDB	lb.	.45 /	.48
Pentex	lb.	1.24 /	1.29
Flour	lb.	.30 /	.35
Permalux	lb.	2.17	
Phenex	lb.	.52 /	.59
Pip-Pip		2.07	
R-2 Crystals	lb.	4.35	
Rotax	lb.	.55 /	.57
RZ-50, -50B	lb.	1.00	
S. A. 52	lb.	1.14	
57, 62, 67, 77	lb.	1.04	
66	lb.	3.00	
Santocure	lb.	.76 /	.78
NS	lb.	.80 /	.82
Selenacs	lb.	3.00	
SPDX-GH	lb.	.69 /	.74
GL	lb.	1.20 /	1.34
Sulfads	lb.	1.98	
Tellurac	lb.	1.30 /	1.55
Tepidone	lb.	.45 /	.48
Tetrone A	lb.	1.91	
Thiates	lb.	.88 /	1.25
Thiofide	lb.	.54 /	.56
S	lb.	.64 /	.66
Thionex	lb.	1.14	
Thiotax	lb.	.44 /	.46
Thiurad	lb.	1.14	
Thiuram E	lb.	1.04	
M	lb.	1.14	
Trimene	lb.	$0.56 /	$0.62
Base	lb.	1.03 /	1.10
Tuex	lb.	1.14	
Ultex	lb.	1.00 /	1.10
Unads	lb.	1.14	
Ureka Base	lb.	.66 /	.73
Vulcacure NB	lb.	.45	
NS	lb.	.75 /	1.05
ZB, ZE, ZM	lb.	.85 /	.89
Z-B-X	lb.	2.45 /	2.50
Zenite	lb.	.52 /	.54
A	lb.	.62 /	.64
Special	lb.	.53 /	.55
Zetax	lb.	.51 /	.53
Zimate	lb.	1.04	

Accelerator-Activators, Inorganic

Lime, hydrated	ton	21.96	
Litharge, comml.	lb.	.1375 /	.18
Eagle, sublimed	lb.	.1385	
National Lead, sublimed	lb.	.1385	
Red lead, comml	lb.	.185 /	.195
Eagle	lb.	.1425	
National Lead	lb.	.1425	
PRD-90	lb.	.38 /	.50
White lead, carbonate	lb.	.19 /	.20
Eagle	lb.	.165 /	.175
National Lead	lb.	.175 /	.185
Silicate	lb.	.1725 /	.1825
Eagle	lb.	.155 /	.2075
National Lead	lb.	.16 /	.17
Zinc oxide, comml.†	lb.	.145 /	.1925

Accelerator-Activators, Organic

Aktone	lb.	.2125 /	.2325
Barak	lb.	.62	
Capital 170	lb.	.20 /	.25
171	lb.	.1425 /	.1925
255, 258, 710	lb.	.14 /	.19
270	lb.	.1175 /	.1425
261	lb.	.155 /	.18
262	lb.	.16 /	.185
263	lb.	.1775 /	.2025
Curade	lb.	.57 /	.59
D-B-A	lb.	1.95	
Emery 600	lb.	.1425 /	.1925
G-M-F	lb.	2.60 /	2.65
PDD-70	lb.	2.70 /	3.00
PGD-25	lb.	1.25 /	1.50
Groco 30	lb.	.1425 /	.1925
35	lb.	.1475 /	.1975
Guantal	lb.	.62 /	.64
Hyfac 410	lb.	.145 /	.17
430	lb.	.18 /	.205
431	lb.	.2025 /	.2275
Hystrene S-97	lb.	.1863 /	.2125
T 45	lb.	.1638 /	.19
T-70	lb.	.1738 /	.20
Industrene B	lb.	.1263 /	.1525
R	lb.	.1138 /	.14
158	lb.	.1313 /	.1575
254	lb.	.1413 /	.1675
262	lb.	.1513 /	.1775
Laurex	lb.	.34 /	.38
MODX	lb.	.295 /	.345
NA-22	lb.	1.00	
PND-70	lb.	1.35 /	1.60
Oleic acid, comml.	lb.	.185 /	.225
Emersol 210 Elaine	lb.	.14 /	.19
Groco 2, 4, 8, 18	lb.	.14 /	.19
Plastone	lb.	.27 /	.30
Polyac	lb.	1.85	
Ridacto	lb.	.25 /	.26
Seedine	lb.	.1485 /	.1703
Stearex Beads	lb.	.1488 /	.1588
Stearic acid			
Emersol 120	lb.	.16 /	.185
150	lb.	.1875 /	.2125
Hydrofoil 51	lb.	.09	
Hydrogenated, rubber grd.			
Groco 56	lb.	.1175 /	.1425
Rufat 75	lb.	.1062 /	.1325
Single pressed, comml.	lb.	.1475 /	.1675
Emersol 110	lb.	.165 /	.19
Groco 53	lb.	.155 /	.18
Wilmar 253	lb.	.1525 /	.1775
Double pressed, comml.	lb.	.1525 /	.1725
Groco 54	lb.	.16 /	.185
Wilmar 254	lb.	.1575 /	.1825
Triple pressed, comml.	lb.	.175 /	.195
Groco 55	lb.	.1775 /	.2025
Wilmar 255	lb.	.1875 /	.2125
Sterene 60-R	lb.	.09 /	.1075
Tonox	lb.	.515 /	.605
Vimbra	lb.	.32 /	.385
Vulklor	lb.	.88 /	1.08
Wilmar 110	lb.	.17 /	.22
434	lb.	.1425 /	.1925
Zinc stearate, comml.	lb.	.39 /	.44

Antioxidants

AC-1	lb.	.37 /	.86
-5	lb.	1.49 /	1.63
AgeRite Alba	lb.	$2.40 /	$2.50
Gel	lb.	.70 /	.72
H. P.	lb.	.79 /	.81
Hipar	lb.	1.05 /	1.07
Powder	lb.	.57 /	.59
Age Resin	lb.	.88 /	.90
D	lb.	.57 /	.59
Spar	lb.	.57 /	.59
Stalite	lb.	.57 /	.59
S	lb.	.57 /	.59
Superlite	lb.	.57 /	.59
White	lb.	1.50 /	1.60
Akroflex C	lb.	.81 /	.83
CD	lb.	.76 /	.78
Albasan	lb.	.69 /	.73
Allied AA 1144	lb.	.23 /	.24
AA-1177	lb.	.155 /	.165
Aminox	lb.	.57 /	.62
Antioxidant 425	lb.	2.47 /	2.50
2246	lb.	1.50 /	1.53
Antisol	lb.	.23 /	.24
Antisun	lb.	.15 /	.51
Antox	lb.	.55 /	.57
Aranox	lb.	3.25 /	3.30
Betanox Special	lb.	.91 /	.96
B-L-E, -25	lb.	.57 /	.62
Burgess Antisun Wax	lb.	.185	
B-X-A	lb.	.55 /	.60
Catalin AC-5	lb.	1.49 /	1.63
Copper Inhibiter X-872-L	lb.	2.01	
D-B-P-C	lb.	.91 /	1.16
Deenax	lb.	.95	
Flectol H	lb.	.57 /	.59
Flexamine	lb.	.79 /	.84
Heliozone	lb.	.31 /	.32
Ionol	lb.	.91 /	1.65
Microflake	lb.	.20 /	.24
Naugawhite	lb.	.57 /	.62
NBC	lb.	1.55	
Neozone A	lb.	.59 /	.61
C	lb.	.83	
D	lb.	.55 /	.57
Nevastain A	lb.	.51 /	.61
B	lb.	.51 /	.70
Octamine	lb.	.57 /	.62
PDA-10	lb.	.46 /	.48
Perflectol	lb.	.61 /	.68
Permalux	lb.	2.17 /	
Polygard	lb.	.57 /	.62
Polylite	lb.	.55 /	.60
Protector	lb.	.26 /	.31
Rio Resin	lb.	.60 /	.62
Santoflex 35	lb.	.72 /	.79
75	lb.	1.01 /	1.03
AW	lb.	.79 /	.81
B	lb.	.52 /	.59
BX	lb.	.63 /	.70
DD	lb.	.57 /	.59
Santovar A	lb.	1.55 /	1.57
Santowhite Crystals, Powder	lb.	1.55 /	1.62
L	lb.	.57 /	.59
MK	lb.	1.25 /	1.32
Stabilite	lb.	.55 /	.59
Alba	lb.	.72 /	.79
L	lb.	.60 /	.64
White	lb.	.52 /	.60
Powder	lb.	.41 /	.47
Styphen I	lb.	.51 /	.55
Sunolite #100	lb.	.21 /	.23
#127	lb.	.17 /	.19
Sunproof-713	lb.	.26 /	.31
Improved	lb.	.25 /	.30
Jr.	lb.	.22 /	.27
Tenamene 3	lb.	.91 /	1.05
Thermoflex	lb.	1.00 /	1.02
Tonox	lb.	.54 /	.59
Tysonite	lb.	.24 /	.2475
Velvapex 51-250	lb.	.40 /	
V-G-B	lb.	.75 /	.80
Wing-Stay S	lb.	.55 /	.67
Zalba	lb.	1.10	
Zenite	lb.	.52 /	.54

* Prices, in general, are f.o.b. works. Range indicates grade or quantity variations. No guarantee of these prices is made. Spot prices should be obtained from individual suppliers.

† For trade names, see Color—White, Zinc Oxides.

‡ At the request of the suppliers, the lowest prices shown for carbon blacks are for carloads in bags. Prices for hopper carloads are lower.

Antiozonants

Eastozone 30, 31	lb.	1.24 /	1.26
32	lb.	1.70 /	1.72
Tenamene 30, 31	lb.	1.24 /	1.28
UOP 88, 288	lb.	1.24 /	1.26

Antiseptics

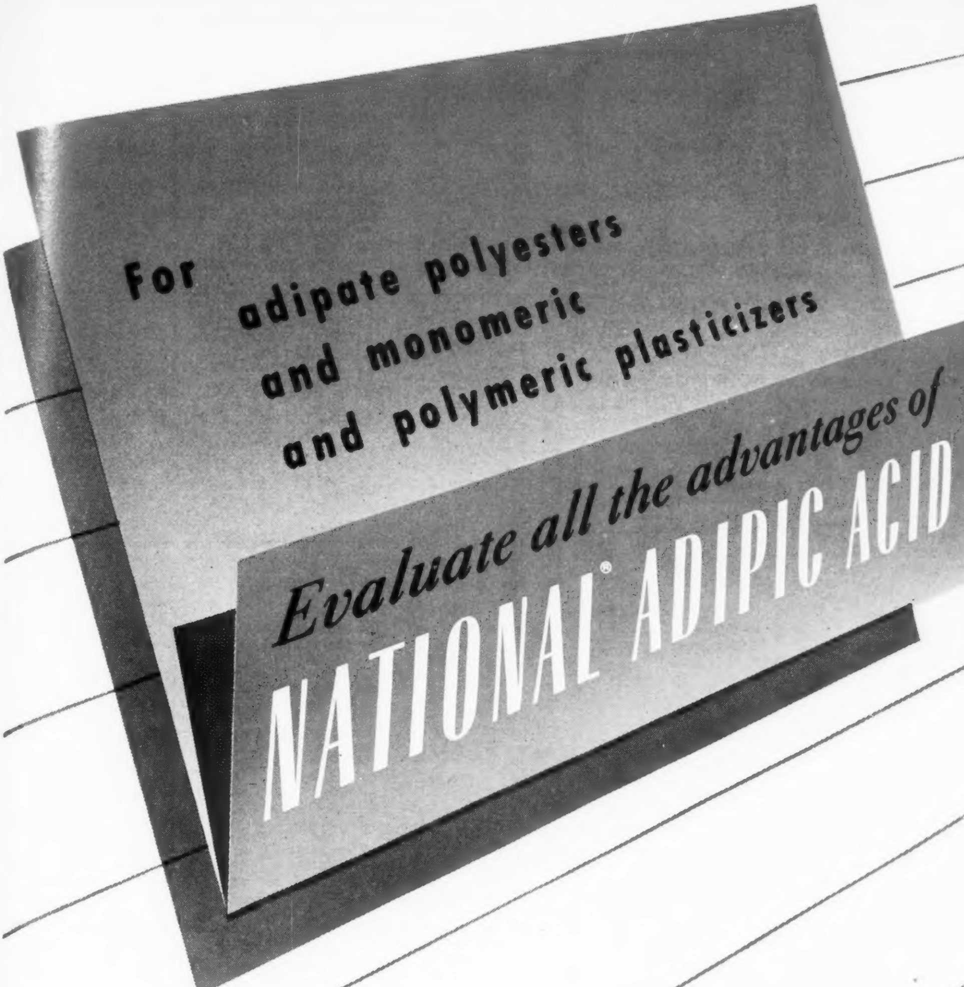
Copper naphthenate, 6-8%	lb.	.245	
Pentachlorophenol	lb.	.22 /	.30
Resorcinol, technical	lb.	.775 /	.785
Zinc naphthenate, 8-10%	lb.	.245 /	.30

Blowing Agents

Ammonium bicarbonate	lb.	.07 /	.09
Carbonate	lb.	.16	
Blowing Agent CP 1475	lb.	.32 /	.35
Celogen	lb.	1.95 /	2.00
50 C	lb.	1.01 /	1.07
Kempore R-125	lb.	1.95	
Opex 40	lb.	.76	
Sodium bicarbonate	100 lbs.	2.55 /	3.85
Carbonate, tech.	100 lbs.	1.35 /	5.52
Sponge Paste	lb.	.20	
Unicel ND	lb.	.76	
NDX	lb.	1.52	
S	lb.	.20	

Bonding Agents

Braze	gal.	6.00 /	9.00
Cover cement	gal.	2.50 /	4.00
Chemlok 201, 203	gal.	5.00 /	7.50
220	gal.	9.25 /	12.00
401	gal.	11.70 /	14.40



If you use or contemplate using Adipic Acid in elastomers, plastics, plasticizers, synthetic lubricants or as a chemical intermediate, we urge you to get a working sample and quotation from National Aniline.

Our product quality has been found outstanding by many substantial users. Strength is 99.8% minimum with low moisture, iron and volatile acids.

Our new non-captive production by a direct, continuous process is completely integrated back to basic materials within the Allied Chemical group.

We can supply the quality and the quantity you need – promptly and dependably – by truck or rail from Hopewell, Virginia with fill-in stocks readily available at many branch office warehouses.

Allied Chemical

NATIONAL ANILINE DIVISION ALLIED CHEMICAL CORPORATION • 40 RECTOR STREET, NEW YORK 6, N. Y.

Akron Atlanta Boston Charlotte Chattanooga Chicago Greensboro Los Angeles New Orleans Philadelphia Portland, Ore. Providence San Francisco Toronto

Chemlok 602	gal.	$25.00 / $26.00
607	gal.	18.00 /
614	lb.	4.35 / 4.75
Flocking Adhesive RFA17, RFA22, RFA25	lb.	.50
G-E Silicone Paste SS-15	lb.	4.52 / 5.10
SS-64	lb.	3.65 / 6.75
-67 Primer	lb.	7.50 / 12.50
Gen-Tac Latex	lb.	.70 / .805
Hylene M	gal.	3.50 / 3.75
M-50	gal.	1.90 / 2.15
Kalabond Adhesive	gal.	6.50 / 16.00
Tie Cement	gal.	2.00 / 5.60
Thixons	gal.	1.48 / 12.00
Ty Ply, BN, Q, S, UP, 3640	gal.	6.75 / 8.00
RC	gal.	3.75 / 5.00

Brake Lining Saturants

BRT 3	lb.	.018 / .0265
Resinex L-S	lb.	.0225/ .03

Carbon Blacks‡

Conductive Channel—CC

Continental R-40	lb.	.23 / .30
Kosmos/Dixie BB	lb.	.23 / .30
Spheron C	lb.	.18 / .24
Voltex	lb.	.18 / .315

Easy Processing Channel—EPC

Collocarb EPC	lb.	.059 / .099
Continental AA	lb.	.074 / .1225
Kosmobile 77/Dixiedensed 77	lb.	.074 / .1225
Micronex W-6	lb.	.0725/ .145
Spheron #9	lb.	.0775/ .145
Texas E	lb.	.0775/ .145
Witco #12	lb.	.074 / .1225
Wyex EPC	lb.	.0775/ .135

Hard Processing Channel—HPC

Continental F	lb.	.074 / .1225
HX HPC	lb.	.074 / .1225
Kosmobile S/Dixiedensed S	lb.	.074 / .1225
Micronex Mk. II	lb.	.0775/ .145
Witco #6	lb.	.074 / .1225

Medium Processing Channel—MPC

Arrow MPC	lb.	.0775/ .135
Continental A	lb.	.074 / .1225
Kosmobile S-66/Dixiedensed S-66	lb.	.0775/ .145
Micronex Standard	lb.	.0725/ .145
Spheron #6	lb.	.0775/ .145
Texas 109	lb.	.084 / .1475
M	lb.	.0775/ .145
Witco #1	lb.	.074 / .1225

Conductive Furnace—CF

Aromex CF	lb.	.0875/ .145
Vulcan C	lb.	.110 / .175
SC	lb.	.18 / .245
XC-72	lb.	.25 / .33

Fast Extruding Furnace—FEF

Arovel FEF	lb.	.0675/ .125
Continex FEF	lb.	.06 / .10
Kosmos 50/Dixie 50	lb.	.06 / .10
Philblack A	lb.	.0675/ .115
Satex M	lb.	.0625/ .125
Sterling SO	lb.	.0675/ .125

Fine Furnace—FF

Statex B	lb.	.0675/ .13
Sterling 99	lb.	.0725/ .13

High Abrasion Furnace—HAF

Aromex HAF	lb.	.0775/ .135
Continex HAF	lb.	.079 / .125
Kosmos 60/Dixie 60	lb.	.079 / .1175
Philblack O	lb.	.0775/ .125
Statex R	lb.	.0725/ .135
Vulcan #3	lb.	.0775/ .135

Intermediate Super Abrasion Furnace—ISAF

Aromex ISAF	lb.	.0925/ .15
Kosmos 70/Dixie 70	lb.	.10 / .145
Philblack I	lb.	.0925/ .14
Statex 125	lb.	.0825/ .15
Vulcan 6	lb.	.0925/ .15

Super Abrasion Furnace—SAF

Philblack E	lb.	.115 / .1625
Statex 160	lb.	.11 / .18
Vulcan 9	lb.	.115 / .18

General-Purpose Furnace—GPF

Arogen GPF	lb.	06 / .1175
Statex G	lb.	.055 / .1175
Sterling V	lb.	.06 / .1175
V Non-staining	lb.	.06 / .1175

High Modulus Furnace—HMF

Collocarb HMF	lb.	.045 / .085
Continex HMF	lb.	.055 / .095
Kosmos 40/Dixie 40	lb.	.055 / .095
Modulex HMF	lb.	.0625/ .12

Statex 93	lb.	$0.0575 / $0.12
980	lb.	.047 / .087
Sterling L, LL	lb.	.0625/ .12

Semi-Reinforcing Furnace—SRF

Collocarb SRF	lb.	.042 / .082
Continex SRF	lb.	.045 / .085
Essex SRF	lb.	.0575/ .115
Furnex	lb.	.0525/ .115
Gastex	lb.	.0625/ .125
Kosmos 20/Dixie 20	lb.	.045 / .085
Pelletex, NS	lb.	.0575/ .115
Sterling NS, S	lb.	.0575/ .115
R	lb.	.0625/ .125

Fine Thermal—FT

P-33	lb.	.0575
Sterling FT	lb.	.0575

Medium Thermal—MT

Sterling MT	lb.	.04
Non-staining	lb.	.05
Thermax	lb.	.04
Stainless	lb.	.05

Colors

Black

Iron oxides, comml	lb.	.1235/ .135
BK—Lansco	lb.	.1275/ .13
Williams	lb.	.145
Lansco synthetic	lb.	.10
Mapico	lb.	.1475/ .15
Lampblack, comml	lb.	.16 / .45
Superjet	lb.	.085 / .12
Permanent Blue	lb.	.80 / 1.05
Stan-Tone	lb.	.45 / 1.20
Vansul masterbatch	lb.	.60 / .65
Paste	lb.	.14 / .15

Blue

Alkali Blue G, R	lb.	2.38
C. P. Iran Blues	lb.	.52 / .54
Du Pont	lb.	1.77 / 4.55
Filo	lb.	.28
Heveatex pastes	lb.	.80 / 1.45
Lansco ultramarines	lb.	.25 / .28
Monsanto Blue 7	lb.	1.55
11	lb.	3.45
DPB-283	lb.	1.93
S-11	lb.	2.05
Permanent Blue	lb.	.80 / 1.05
Stan-Tone Violet Blue		
D-4000	lb.	3.45
4001	lb.	3.00
4002	lb.	.90
4900	lb.	1.97 / 2.15
Vansul masterbatch	lb.	.90 / 2.70

Brown

Filo	lb.	.13
Iron oxides, comml	lb.	.1425/ .145
Lansco synthetic	lb.	.125
Mapico Brown	lb.	.1575/ .16
Sienna, burnt, comml	lb.	.0425/ .155
Williams	lb.	.115 / .1775
Raw, comml	lb.	.045 / .1325
Williams	lb.	.08 / .1725
Umber, burnt, comml	lb.	.06 / .07
Williams	lb.	.0725/ .085
Raw, comml	lb.	.0625/ .07
Williams	lb.	.07 / .0825
Williams, pure brown	lb.	.155
Vandyke	lb.	.12
Mapico Tan	lb.	.2325/ .235
Metallic Brown	lb.	.05 / .06
Vansul masterbatch	lb.	2.10 / 2.20

Green

Chrome	lb.	.19 / .50
Green	lb.	.80 / 2.40
Oxide	lb.	.3925/ 1.10
Cyanamid	lb.	.42 / .44
Green G	lb.	3.50 / 3.95
Lincoln Green	lb.	5.30 / 6.60
G-4099, -6099	lb.	.4525
GH-9869	lb.	1.10 / 1.25
9976	lb.	1.20 / 1.35
Du Pont	lb.	1.97 / 2.80
Filo	lb.	.40
Heveatex pastes	lb.	.95 / 1.85
Lansco Toner	lb.	1.35
Monsanto Green 3	lb.	2.75
14	lb.	1.45
17	lb.	3.95
71205	lb.	1.35
DGP	lb.	2.03
S-17	lb.	2.25
Stan-Tone		
D-5000	lb.	3.95
5001	lb.	.82
5400	lb.	1.45
Vansul masterbatch	lb.	2.00 / 2.60

Orange

Cyanamid Permatons	lb.	1.50 / 1.56
Du Pont	lb.	2.75
Monsanto Orange 68187	lb.	2.90
Stan-Tone		
Light orange D-7003	lb.	3.97 / 4.17
70 PCO3	lb.	2.48 / 2.76
Orange 70 PCO4	lb.	2.80 / 3.08
D-7004	lb.	4.23 / 4.43
D-7104	lb.	1.85 / 2.05
Vansul masterbatch	lb.	2.00 / 2.60

Red

Antimony trisulfide	lb.	$0.285 / $0.315
R. M. P. No. 3	lb.	.72
Sulfur Free	lb.	.78
Brilliant Toning Red	lb.	1.95
Cadmium red lithopones	lb.	2.21 / 3.77
Cadmolith	lb.	1.72 / 2.20
Cyanamid	lb.	.93 / 1.90
Naphthol Red, Scarlet	lb.	2.95 / 3.80
Du Pont	lb.	1.47 / 1.90
Filo	lb.	.11
Indian Red	lb.	.1275
Iron oxide, comml	lb.	.06 / .13
Lansco synthetic	lb.	.1175
Mapico	lb.	.1425/ .145
Recco	lb.	.12
Williams Red	lb.	.13 / .1525
Monsanto Maroon 113	lb.	1.50
61148	lb.	1.75
Red 7	lb.	1.55
41	lb.	4.40
3501	lb.	1.15
4004	lb.	1.50
69191	lb.	3.38
Autumn	lb.	1.10
PRP-285	lb.	1.27
S-44	lb.	1.28
Rub-Er-Red	lb.	.0975
Stan-Tone		
D-2000	lb.	1.25
2110, 2120, 2121	lb.	.98
2200	lb.	1.47
2500	lb.	1.90
2600	lb.	4.60
2601	lb.	1.60
2700	lb.	1.75
2800	lb.	1.90
Light Red D-7005	lb.	4.68 / 4.88
D-7105	lb.	1.97 / 2.17
70 PCO5	lb.	3.00 / 3.28
Red D-7006	lb.	4.89 / 5.09
D-7106	lb.	2.20 / 2.40
70 PCO6	lb.	3.35 / 3.63
Vansul masterbatch	lb.	.95 / 3.30
Venetian	lb.	.04 / .0675

White

Antimony oxide	lb.	.27 / .285
Burgess Iceberg	ton	50.00 / 80.00
Cryptone BT	lb.	.10 / .11
Permolith lithopone	lb.	.08 / .087
Titanium pigments		
Horse Head Anatase	lb.	.255 / .27
Rutile	lb.	.275 / .29
Rayox LW	lb.	.195 / .205
R-110	lb.	.215 / .225
Ti-Cal	lb.	.075 / .0825
Ti-Pure	lb.	.195 / .225
Titanox A, AA, A-168	lb.	.255 / .265
C-50	lb.	.1438/ .1488
RA, -10, -50	lb.	.275 / .285
RC	lb.	.0963/ .1013
-HT, -HTX	lb.	.0963/ .0988
Unitane	lb.	.255 / .29
Zopaque Anatase	lb.	.245 / .27
Rutile	lb.	.205 / .29
Zinc oxide, comml	lb.	.145 / .1825
Azo ZZZ-11, -44, -55	lb.	.145 / .165
20% leaded	lb.	.1505/ .1705
35% leaded	lb.	.155 / .175
50% leaded	lb.	.1588/ .1788
Eagle AAA, lead free	lb.	.145 / .155
5% leaded	lb.	.145 / .155
35% leaded	lb.	.1513/ .1613
50% leaded	lb.	.1538/ .1638
Florence Green Seal	lb.	.1625/ .1725
Red Seal	lb.	.1575/ .1675
White Seal	lb.	.1675/ .1775
Horsehead XX-4, -78	lb.	.145 / .155
Kadox-15, -17, -72, -515	lb.	.145 / .155
-25	lb.	.1675/ .1775
Lehigh, 35% leaded	lb.	.1513/ .1613
50% leaded	lb.	.1538/ .1638
Protox-166, -167	lb.	.145 / .155
St. Joe, lead free	lb.	.145 / .175
Zinc sulfide, comml	lb.	.253 / .263
Cryptone ZS	lb.	.253 / .263

Yellow

Cadmium yellow lithopones	lb.	1.12 / 1.15
Cadmolith	lb.	1.12 / 1.20
Cyanamid Hansa Yellow	lb.	2.20
Du Pont	lb.	1.80 / 2.25
Filo	lb.	.10
Iron oxide, comml	lb.	.0525/ .1175
Lansco synthetic	lb.	.1075
Mapico	lb.	.12 / .1275
Williams	lb.	.115 / .1225
Monsanto Yellow 14	lb.	1.91
10010	lb.	1.91
BYP-282	lb.	1.21
GA	lb.	2.45
S-10010	lb.	1.17
Stan-Tone		
D-1100	lb.	2.55
1101	lb.	.69
Lemon 70 PCO1	lb.	1.77 / 2.19
D-7001	lb.	2.80 / 3.00
Medium yellow 70 PCO2	lb.	1.79 / 2.21
D-7002	lb.	2.98 / 3.18
Vansul masterbatch	lb.	.95 / 1.95
Williams Ocher	lb.	.0575/ .06

Dusting Agents

Diatomaceous silica	ton	32.00 / 48.00
Extrud-o-Lube, conc.	gal.	1.33 / 1.69
Glycerized Liquid Lubricant, concentrated	gal.	1.25 / 1.63

CLASSIFIED ADVERTISEMENTS

All Classified Advertising Must Be Paid in Advance

(No agency commission allowed except on display units)

GENERAL RATES	Light face type $1.25 per line (ten words) Bold face type $1.60 per line (eight words)
SITUATIONS WANTED RATES	Light face type 40c per line (ten words) Bold face type 55c per line (eight words)
SITUATIONS OPEN RATES	Light face type $1.00 per line (ten words) Bold face type $1.40 per line (eight words) **Allow nine words for keyed address.**

Letter replies forwarded without charge, but no packages or samples.

ADDRESS ALL REPLIES TO NEW YORK OFFICE AT 386 FOURTH AVENUE, NEW YORK 16, N. Y.

SITUATIONS OPEN

WANTED!

GENERAL MANAGER RUBBER PLANT

$15,000 a year including bonus

AGGRESSIVE, successful manager who grew up in production of precision molded and extruded items in plant of moderate size. He has progressed through production and sales into general management. He has initiative and is aggressive, but finds his promotion and future presently blocked. Such a man will now find a real opportunity with this expanding producer and merchandiser of quality molded and extruded rubber products. Eastern Location.

QUALIFICATIONS: Age 35-45. *Education* — degree level including some engineering and business administration. *Experience* — rubber production (6 years); sales (2 years); record as a proven producer in general management (2 years).

Submit complete resume of education, experience, earnings to

Personnel Manager

OLIVER TIRE & RUBBER COMPANY

1256 - 65TH STREET, OAKLAND 8, CALIFORNIA

WANTED: MANUFACTURER'S REPRESENTATIVE TO SELL our line of high-quality molded long fiber asbestos-rubber gaskets both for original equipment and replacement sales.

Need aggressive individual in Chicago, Ill., Philadelphia, Pa., Cleveland, Ohio, St. Louis, Mo., Los Angeles, Calif., Pittsburgh, Pa., Boston, Mass. New York City, or Metropolitan Newark, N. J. Address Box No. 2214, care of RUBBER WORLD.

WANTED BY LARGE FOOTWEAR MANUFACTURER—MAN completely familiar with manufacture of Slush Molded Footwear and other Slush Molded items. Must know all phases of manufacture and mold design. To take complete charge. Excellent opportunity for experienced man only. Address Box No. 2216, care of RUBBER WORLD.

SITUATIONS WANTED

MANUFACTURING EXECUTIVE ENGINEER WITH 17 YEARS' experience in factory management, product development, latex and solid elastometers, compounding, machinery design, and production trouble shooting. Aggressive and full of initiative. Cost reduction through modern industrial engineering techniques and scientific management. Experienced in marketing, sales management, and foreign trade. Responsible position with progressive manufacturer desired. Languages, European or Latin American Post preferred. Will consider sales and traveling. Address Box No. 2213, care of RUBBER WORLD.

CHEMIST—8 YEARS' EXPERIENCE, RUBBER & PLASTICS. Adhesives, film, molding. Plastisols, Organosols & Emulsions, Quality Control. Address Box No. 2219, care of RUBBER WORLD.

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bring prompt results at low cost.

MACHINERY & SUPPLIES FOR SALE

HYDRAULIC PRESSES, 2500-TON DOWNSTROKE 54" x 102". 325-Ton upstroke 28" x 28". 300-Ton upstroke 40" x 30". 300-Ton upstroke 22" x 35". 250-Ton French Oil upstroke 38" x 28". 170-Ton upstroke 24" x 24". 150-Ton Elmes upstroke 36" x 25". 140-Ton 36" x 36" platens. 300-Ton Stokes Transfer Molding Press. New & Used Lab. 6" x 13", 6" x 16", and 8" x 16" Mills and Calenders. & sizes up to 84". Baker-Perkins & Day Heavy-Duty Jack. Mixers up to 200 gals. Hydraulic Pumps & Accumulators, Rotary Cutters. Colton 5½ T, 4T & 3DT Preform Machines motor driven. Other sizes in Single-Punch & Rotary Pre-Form Machines. Banbury Mixers, Crushers, Churns, Tubers, Vulcanizers, Bale Cutters, Gas Boilers, etc. SEND FOR SPECIAL BULLETIN. WE BUY YOUR SURPLUS MACHINERY. STEIN EQUIPMENT COMPANY, 107-8TH STREET, BROOKLYN 15, NEW YORK. STERLING 8-1944.

NEW and REBUILT MACHINERY

Since 1891

L. ALBERT & SON

Trenton, N. J., **Akron, Ohio,** **Chicago, Ill.,** **Los Angeles, Calif.**

HOGGSON

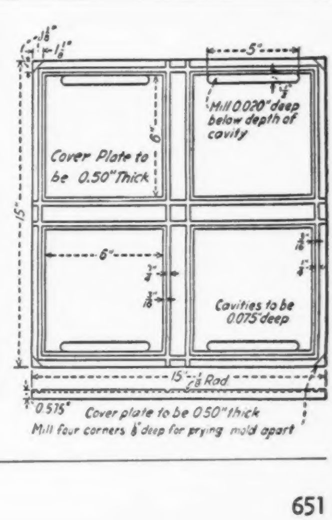
"DUMBBELL" Test Strip Die D412(51T)

TOOLS, MOLDS, DIES

For Rubber Testing and Production

For making tensile test samples, we make many types of slab molds. One is detailed at the right. These are plain or chrome finished. We usually stock molds for making adhesion, abrasion, flexing, compression and rebound test samples, but supply special molds promptly. We also furnish hand-forged tensile dies for cutting regular or tear test samples.

SLAB→ MOLD D15-41



HOGGSON & PETTIS MFG. CO., 141S Brewery St., New Haven 7, Conn.

Pac. Coast: H. M. Royal, Inc., Downey, Calif.

Latex-Lube GR	lb.	$0.20	
Pigmented	lb.	.1825	
R-66	lb.	.165	
Liqui-Lube	lb.	.1625	
N. T.	lb.	.1675	
Liquizinc No. 305	lb.	.30 /	$0.35
Lubrex	lb.	.25 /	.30
Mica, 160 Biotite	lb.	.065 /	.0725
Mesh	lb.	.08 /	.0875
325 Mesh	lb.	.0825/	.09
Concord	lb.	.08 /	.09
Mineralite	ton	45.00	
Pyrax A	ton	14.50 /	15.00
W. A.	ton	17.00 /	17.50
Talc, comml.	ton	18.40 /	38.50
EM	ton	11.00 /	63.00
LS Silver	ton	29.25	
Nytals	ton	25.00 /	36.00
Sierra Sagger 7	ton	34.00	
White IR	ton	19 75	
III	ton	20.75	
Vanfre	gal.	2.00	

Extenders

BRS 700	lb.	.02 /	.0285
BRT 7	lb.	.03 /	.031
Cumar Resins	lb.	.065 /	.17
Dielex B	lb.	.06	
Factice, Amberex	lb.	.29 /	.36
Brown	lb.	.1425/	.263
Neophax	lb.	.157 /	.268
White	lb.	.144 /	.285
G. B. Asphaltenes	lb.	.097 /	.177
Millex, W	lb.	.07	
Mineral Rubbers			
Black Diamond	ton	38.00 /	40.00
Hard Hydrocarbon	ton	46.50 /	48.50
Hydrocarbon MR	ton	45.00 /	55.00
Parmr	ton	21.00 /	29.00
T-MR Granulated	ton	47.50 /	50.00
Nuba No. 1, 2	lb.	.0575/	.0625
3X	lb.	.0775/	.0825
OPD-101	lb.	.26	
Rubber substitute, brown	lb.	.16 /	.2572
Car-Bel-Ex A	lb.	.14	
Car-Bel-Lite	lb.	.35	
Extender 600	lb.	.1765	
White	lb.	.192 /	.2103
Stan-Shells	ton	35.00 /	73.00
Sublac Resin PX-5	lb.	.215 /	.235
Sundex 53	gal.	.12	
85	gal.	.1725	
Synthetic 100	lb.	.41	
Vistanex	lb.	.35 /	.475

Fillers, Inert

Agrashell flour	ton	50.00 /	74.00
Albacar	ton	55.00 /	75.00
Barytes, floated, white	ton	49.00 /	70.85
Off-color, domestic	ton	25.00	
No. 1	ton	55.00 /	77.50
2	ton	50.00 /	72.50
Sparmite	ton	95.00 /	117.00
Blanc fixe	ton	100.00 /	165.00
Burgess Iceberg	ton	50.00 /	80.00
Pigment #20	ton	35.00 /	60.00
#30	ton	37.00 /	60.00
HC-75	ton	12.00 /	30.00
-80	ton	14.00 /	32.00
WP #1	ton	11.00 /	16.00
Camel-Carb	ton	14.00	
-Tex	ton	22.00	
-Wite	ton	35.00	
Cary #200	ton	30.00 /	55.00
Citrus seed meal	lb.	.04	
Oil	lb.	.15	
Clays			
A. F. D. Filler	ton	29.50 /	36.00
Aiken	ton	14.00	
Albacar	ton	50.00 /	55.00
Aluminum Flake, coarse	ton	25.50 /	28.50
Fine	ton	29.50 /	36.00
#5	ton	27.50 /	34.50
Champion	ton	14.50	
Crown	ton	14.00 /	33.00
Dixie	ton	14.50	
Franklin	ton	13.50 /	35.25
GK Soft Clay	ton	11.00	
Harwick	ton	15.50 /	55.50
Hi-White R	ton	14.50 /	19.50
Hydratex R	ton	28.00	
Kaolloid	ton	10.50	
McNamee	ton	14.50	
RX-43	ton	33.00	
Natka 1200	ton	13.00	
Par	ton	13.00	
Paragon	ton	14.50 /	19.50
Recco	ton	14.00	
Sno-Brite	ton	12.50	
Stan-Clay	ton	28.00	
Stellar-R	ton	50.00	
Suprex	ton	14.50 /	19.50
Swanee	ton	12.50	
Windsor	ton	14.00 /	30.00
DC Silica	lb.	1.15 /	1.40
Diatomaceous silica	ton	32.00 /	48.00
Flocks			
Cotton, dark	lb.	.095 /	.135
Dyed	lb.	.55 /	.60
White	lb.	.13 /	.33
Fabrifil X-24-G	lb.	.135	
X-24-W	lb.	.235	
Filfloc 6000	lb.	.33	
F-40-900	lb.	.135	
HSC #35 Silicone Emulsion	lb.	1.22 /	2.46
Kalite	ton	52.50 /	67.50
Lithopone, comml.	lb.	$0.075 /	$0.085
Astrolith	lb.	.068 /	.0675
Eagle	lb.	.0725/	.075
Permolith	lb.	.08 /	.0875
Sunolith	lb.	.075 /	.0825
Mica, 160 Biotite	lb.	.065 /	.0725
Mesh	lb.	.08 /	.0875
325 Mesh	lb.	.0825/	.09
Concord	lb.	.08 /	.09
Millical	ton	38.00 /	53.00
Mineralite	ton	40.00 /	60.00
Non-Fer-Al	ton	35.00 /	50.00
Ohio Superspray lime	ton	16.50	
Pulverized limestone, Stone-lite	ton	8.25 /	11.00
Purecal	ton	56.75 /	71.75
Pyrax A	ton	13.50	
W. A.	ton	16.00	
Sawdust	ton	14.00 /	35.00
Silversheen Mica	lb.	.08 /	.09
StanWhite	ton	10.50 /	13.10
Super-White Silica	ton	25.00 /	46.50
Surfex	ton	37.50 /	52.50
MM	ton	42.00 /	57.00
Suspenso	ton	38.00 /	53.00
Ti-Cal	lb.	.0675	
Valron Estersil	lb.	2.00 /	2.25
Walnut shell flours	ton	50.00 /	84.00
Whiting, limestone			
Atomite	ton	32.50 /	35.00
Calcite	ton	23.00	
Calwhite	ton	20.00 /	27.00
-T	ton	23.00	
Duramite	ton	20.00	
Gamaco	ton	32.50 /	40.00
Keystone	ton	20.00 /	22.00
Laminar	ton	30.00	
No. 10 White	ton	11.00 /	16.50
Omya	ton	30.00	
BSH	ton	45.00	
Paxinosa	ton	14.50 /	22.50
Snowflake	ton	17.00 /	18.00
Witco	ton	13.00	
York	ton	9.50	

Finishes

Apex Bright Finish #5200-E	lb.	.25	
Rubber Finish	gal.	2.50	
Black-out	gal.	4.50 /	8.00
Flocks, Rayon, colored	lb.	.90 /	1.50
White	lb.	.75 /	1.25
Also see Flocks, under Fillers, Inert			
Paraflint RG and RGU Synthetic Wax	lb.	.15 /	.22
Rubber lacquer, clear	gal.	1.00 /	2.00
Shellacs, Angelo	lb.	.485 /	.7325
Vac Dry	lb.	.485 /	.57
Talc (*See Talc, under Dusting Agents*)			
Unidip	lb.	.15 /	.20
Wax, Bees	lb.	.68 /	.83
Carnauba	lb.	.57 /	1.13
Monten	lb.	.27	
No. 118, colors	gal.	.86 /	1.41
Neutral	gal.	.76 /	1.31
Van Wax	gal.	1.45 /	1.50

Latex Compounding Ingredients

Acintol D, DLR	lb.	.06 /	.075
FA #1	lb.	.065 /	.08
#2	lb.	.075 /	.09
Accelerator 552	lb.	2.25	
J-117, -302	lb.	1.00 /	1.15
-144	lb.	.15 /	.30
-307	lb.	1.10 /	1.25
-311	lb.	.60 /	.75
Aerosol, dry types	lb.	.39 /	1.20
Liquid types	lb.	.40 /	.72
Alcogum AA-16, MA-16	lb.	.20 /	.24
AK-12, PA-10	lb.	.12 /	.14
AN-6	lb.	.05 /	.075
-10	lb.	.085 /	.10
Alrosol	lb.	.41	
Amberex solutions	lb.	.1675/	.18
Antifoam J-114	lb.	3.25 /	3.45
P-242	lb.	.24 /	.35
Antioxidant J-137, -140	lb.	.55 /	.70
-139, -293	lb.	1.45 /	1.60
-182	lb.	2.00 /	2.15
-186	lb.	1.40 /	1.55
2246	lb.	1.50 /	1.53
Anti Webbing Agent J-183	lb.	.75 /	.90
-297	lb.	.27 /	.40
Aquablak B	lb.	.0975/	.1025
G	lb.	.12 /	.125
K	lb.	.12 /	.125
M	lb.	.105 /	.11
Aquarex D	lb.	.78	
G	lb.	.21	
L	lb.	.94	
MDL	lb.	.33	
ME	lb.	.80	
Aquarex NS	lb.	.60	
SMO	lb.	.50	
WAQ	lb.	.22	
Areskap 50	lb.	.30 /	.38
100, dry	lb.	.60 /	.72
Aresket 240	lb.	.30 /	.38
300, dry	lb.	.60 /	.72
Aresklene 375	lb.	.42 /	.57
Ben-A-Gels	lb.	.98 /	1.40
Bentone 18, 18C	lb.	.45	
34	lb.	.60	
Casein	lb.	.22	
Cellosize WP-09, -3, -40			
-300	lb.	1.00 /	1.17
CW-12		.85	
-37	lb.	.70	
DC Antifoam A Compound	lb.	$5.45 /	$6.65
B	lb.	.68 /	1.20
Emulsion	lb.	2.05 /	4.00
AF Emulsion	lb.	2.05 /	2.85
Compound 7	lb.	5.13 /	6.50
Defoama W-1701	lb.	.125	
Defoamer 115a	lb.	.50	
Dispersing Agents			
Blancol	lb.	.1525/	.26
N	lb.	.155 /	.26
Darvan Nos. 1, 2, 3	lb.	.22 /	.30
Daxad 11, 21, 23, 27	lb.	.08 /	.30
Dispersaid H7A	lb.	.58	
1159	lb.	.43	
Emulphor ON-870	lb.	.50 /	.70
Igepal CO-630	lb.	.2875/	.47
Igepon T-73	lb.	.285 /	.495
T-77	lb.	.45 /	.69
Indulins	lb.	.06 /	.08
Kreelons	lb.	.132 /	.155
Laurelton Oil	lb.	.18	
Leonil SA	lb.	.52 /	.65
Lomar PW	lb.	.18	
Marasperse CB	lb.	.1225/	.1425
N	lb.	.095 /	.105
Modicols	lb.	.17 /	.58
Nekal BA-75	lb.	.395 /	.54
BX-76	lb.	.63 /	.75
Orzan A	lb.	.0325	
S	lb.	.0425	
Pluronics	lb.	.335 /	.40
Polyfons	lb.	.08 /	.09
Sorapon SF-78	lb.	.28 /	.40
Tergitol NPX	lb.	.275 /	.3074
TMN	lb.	.2875/	.32
7	lb.	.4125/	.44
Trenamine W-30	lb.	.15	
W-40	lb.	.60 /	.75
Triton R-100	lb.	.12 /	.25
X-100, -102, -114	lb.	.255 /	.36
Dispersions			
Agebest 1293-22	lb.	1.90 /	2.00
AgeRite Alba	lb.	3.00	
Powder, Resin D	lb.	.80	
White	lb.	1.80	
Altax	lb.	.75	
Shield Nos. 2, 6	lb.	.08	
3	lb.	.095	
4-35	lb.	.09	
5	lb.	.093	
7-F, 8	lb.	.165	
55	lb.	.18	
Iron Oxide, 60%	lb.	.40	
L.S.W.	lb.	1.50	
No. 305 Liquizinc	lb.	.30 /	.35
P-33	lb.	.35	
Rotax	lb.	.75	
Sulfur	lb.	.12 /	.30
No. 2	lb.	.14 /	.16
Telloy	lb.	3.00	
Tuads, Methyl	lb.	1.14	
Vulcacure NB	lb.	.45	
NS	lb.	.75 /	1.05
ZB, ZE, ZM	lb.	.85 /	.89
Vulcanizing, C group	lb.	.40 /	1.30
G group	lb.	.45 /	.90
N group	lb.	.40 /	1.00
Vulcafoams	lb.	.40 /	.70
Vulcanols	lb.	.75 /	.80
Zetax	lb.	.75	
Zimates, Butyl	lb.	1.04	
Ethyl, Methyl	lb.	1.04	
Zinc oxide	lb.	.40	
Emulsions			
AgeRite Stalite	lb.	.75	
Borden Arcco A-25, A-26, 716-30	lb.	.18 /	.19
555-40-R	lb.	.185 /	.205
620-32B	lb.	.20 /	.21
716-35	lb.	.17 /	.18
1041-21	lb.	.165 /	.175
Habuco Resin Nos. 502, 515, 523	lb.	.195 /	.20
503	lb.	.22 /	.225
504, 526	lb.	.19 /	.195
517	lb.	.175 /	.18
524	lb.	.155 /	.16
Resin A-2	lb.	.16 /	.25
P-370	lb.	.175 /	.25
X-210	lb.	.12 /	.22
Freeze-Stabilizer 322	lb.	.40	
12116C	lb.	.52	
Igepon T-43	lb.	.145 /	.35
T-51	lb.	.125 /	.285
-73	lb.	.285 /	.495
Ludox	lb.	.1675/	.195
Marmix	lb.	.41 /	.48
Merac	lb.	.75 /	1.05
Micronex, colloidal	lb.	.06 /	.072
Monsanto Blue 4685 WD	lb.	1.60	
Green 4884 WD	lb.	1.80	
Red 127	lb.	1.25	
OPD 101	lb.	.16 /	.26
Picco Latex Plasticizer A-12	lb.	.069 /	.096
Pliolite Latex 150, 190	lb.	.32 /	.41
170	lb.	.37 /	.46
Polyvinyl methyl ether	lb.	.25 /	.45
Resin V	lb.	.13	
Roelgel 100C	lb.	.46	
Santomerse D	lb.	.44 /	.65
S	lb.	.13 /	.25
Sellogen Gel	lb.	.1275	
Sequestrene AA	lb.	.905 /	.975
30A	lb.	.245 /	.265
ST	lb.	.585 /	.615
Setsit #5	lb.	.75 /	1.05
D #9	lb.	.85 /	1.15
Stablex A	lb.	.80 /	1.10
B, G	lb.	.50 /	.95
K	lb.	.27 /	.35

MACHINERY & SUPPLIES FOR SALE (Cont'd.)

FOR SALE: ALL IN STOCK: 10—Baker-Perkins #17 200-gal. sigma-blade mixers. 5—Pfaudler 500-gallon glass-lined Reactors, 6—465-gal. stainless Reactors, 150# W.P., 165# jkt. 3—4' x 84" vert. Vulcanizers, quick-opening doors, ASME 120#. 1—Farrel 500/1500 HP Horiz. Reducer. PERRY EQUIPMENT CORP., 1424 N. 6th St., Phila. 22, Pa.

FARREL-BIRMINGHAM #9 BANBURY MIXER COMPLETE WITH motor $14,000, 16 x 42" F.-B. Rubber Mill with motor $3,500, 14 x 24" F.-B. Rubber Mill without motor $1,800, Three-Roll F.-B. Calender 18 x 48" with motor $7,000, #2 Royle Perfected Extruder without motor $1,400, 6 x 15' Horizontal Vulcanizer with quick-opening door 100 lbs. Certificate $2,200, all machines in good condition. ERIC BONWITT, 431 S. Dearborn St., Chicago 5, Ill.

SURPLUS EQUIPMENT

4—Blaw Knox 6' x 40' Horizontal Vulcanizers with quick-opening doors, 250# working pressure, ASME.

1—Bolling 3-roll Laboratory Calender, 8" x 16".

2—Royle # ½ Extruders, complete.

1—Banbury Midget Mixer with 2 HP gear motor.

1—Farrel Birmingham 3-roll Lab Calender, 6" x 12".

ADDRESS BOX NO. 2151, c/o RUBBER WORLD

FOR SALE—NEW SIZE 27 BANBURY MIXER

New Size 27 Banbury Mixer with Unit Drive, Rotor Speed 25 RPM, complete 1250 HP Westinghouse 2300/4000-volt 900 RPM Induction Motor 1250-HP G. E. Control. All original crates. Attractive price. Address Box No. 2217, care of RUBBER WORLD.

1-BANBURY 3A 100/200 HP and 1 MILL FARREL-BIRMINGHAM 60" x 22" 125 HP. Good Condition. Address Box No. 2220, care of RUBBER WORLD.

FOR SALE: 3—6 x 12 Lab 2-roll mills, 3—100- & 150-gal. Baker Perkins heavy-duty Mixers 100 hp., 1—#1 Ball & Jewell Rotary Cutter, Powder Mixers, Tablet Presses, Screens. Your inquiries solicited. BRILL EQUIPMENT COMPANY, 2401 Third Ave., New York 51, N. Y.

FOR SALE—1-THROPP 16 x 40"—2-ROLL MILL, 50 HP; 1—4 x 12' vulcanizer, Q-O door, 1-Farrel 16 x 48" 3-roll calender, 3-lab presses, 12 x 12" and 15 x 15", also, extruders, cutters, mixers, etc. CHEMICAL & PROCESS MACHINERY CORP., 52 Ninth Street, Brooklyn 15, N. Y.

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in calender and mill frame construction — frames of fabricated steel weldments — lifetime guarantee — new machines built in any size

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SHERMAN RUBBER MACHINERY CO.

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A-2 SCALE (A.S.T.M. D676)

VARIOUS OTHER MODELS FOR TESTING THE ENTIRE RANGE

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Do you have used rubber machinery for sale?

HOUSTON RUBBER MACHINE CO.

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Let us know your needs

HOWE MACHINERY CO., INC.

30 Gregory Avenue, Passaic, N. J.

DESIGNERS & BUILDERS OF "V" BELT MANUFACTURING EQUIPMENT

Cord Latexing, expanding mandrels, automatic cutting skiving, flipping and roll drive wrapping machines.

ENGINEERING FACILITIES FOR SPECIAL EQUIPMENT

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FLEXO JOINTS

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• Proved in years of efficient service, FLEXO JOINTS offer the flexibility of hose — the strength of pipe — the ideal steam connection for presses, tire molds, etc.

Four styles, for standard pipe sizes ¼" to 3".

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BROCKTON TOOL COMPANY

Central Street — QUALITY MOULDS FOR ALL PURPOSES — South Easton, Mass.

THE FIRST STEP — A QUALITY MOULD

tablex P	lb.	$0.35	$0.50
T	lb.	.14	.22
Surfactol 13	lb.	.345	.36
Webnix	lb.	1.50	2.50

Mold Lubricants

Acintol D	lb.	.06	.75
A-C Polyethylene	lb.	.30	.47
Alipal CO-433	lb.	.25	.45
CO-436	lb.	.22	.41
Aquarex Compounds	lb.	.21	.94
Carbowax 200, 300, 400	lb.	.22	.25
1500	lb.	.255	.2825
4000	lb.	.31	.32
6000	lb.	.35	.36
Castorwax	lb.	.3375	.3575
Colite Concentrate	gal.	.90	1.15
D-Tak Dip #10	gal.	1.50	
DC Mold Release Fluid	lb.	3.14	4.75
Compound 4, 7	lb.	5.13	6.50
Emulsion 7	lb.	1.20	1.74
8, 35, 35A, 35B, 36	lb.	1.20	1.74
200 Fluid	lb.	3.14	4.75
ELA	lb.	.82	
FT Wax 200	lb.	.265	.42
300	lb.	.295	.45
Glycerized Liquid Lubricant, concentrated	gal.	1.25	1.63
Igepals	lb.	.2875	.74
Igepon AP-78	lb.	.44	.68
T-43	lb.	.145	.35
-51	lb.	.125	.285
-73	lb.	.285	.495
Lubrex	lb.	.27	.32
Lubri-Flo	gal.	10.00	12.05
Lustermold	lb.	.41	
L-41 Diethyl Silicone Oil	lb.	3.50	
Mold Paste	lb.	.25	
Monopole Oil	lb.	.16	
Monten Wax	lb.	.57	
Para Lube	lb.	.046	.048
Paraflint RG and RGU Synthetic Wax	lb.	.15	.22
Plaskon 8406, 8407	lb.	.30	.37
8416, 8417	lb.	.35	.42
8429	lb.	.40	.47
Pluronics	lb.	.335	.44
Poly-Brite PE-200	lb.	.28	.42
600	lb.	.42	.58
Poly-Cone 125X	lb.	1.20	1.40
1000	lb.	.93	1.06
Polyglycol E series	lb.	.29	.42
RA-1, -2, -3	gal.	2.25	3.00
Rubber Glo	gal.	.94	.97
SM-33, -55, -61, -62	lb.	1.22	1.76
Soap, Hawkeye	lb.	1.35	1.45
Purity	lb.	.155	.165
Sodium stearate	lb.	.40	
Stoner's 700 series	gal.	1.20	1.25
800 series	gal.	1.26	1.70
900 series	gal.	1.55	2.55
A Series	gal.	1.80	4.50
Ucon 50-HB Series	lb.	.25	.375
Ulco	lb.	.12	.23
Vanfre	gal.	1.95	3.00

Odorants

Alamasks	lb.	.75	6.50
Coumarin	lb.	2.95	3.55
Curodex 19	lb.	4.75	5.05
188	lb.	5.75	
198	lb.	5.75	
Ethavan	lb.	6.75	7.35
Latex Perfume #7	lb.	4.00	
Neutroleum Gamma	lb.	3.60	
Rodo	lb.	4.00	5.50
Rubber Perfume #10	lb.	2.60	
Vanillin, Monsanto	lb.	3.00	3.15

Plasticizers and Softeners

Acintol R	lb.	.065	.07
Adipol 2EH, 10A, XX	lb.	.40	.435
BCA	lb.	.43	.455
ODY	lb.	.43	.465
Admex 710	lb.	.325	
711	lb.	.345	
744	lb.	.40	
Aro Lene #1980	lb.	.10	.12
Baker AA Oil	lb.	.195	.24
Crystal O Oil	lb.	.21	.255
Processed oils	lb.	.215	.235
Bardol, 639	lb.	.215	.235
B	lb.	.0625	.065
Benzoflex 2-45	lb.	.26	.29
9-88	lb.	.27	.30
Bondogen	lb.	.555	.605
BRC 20	lb.	.15	.175
22	lb.	.025	.0275
30	lb.	.0125	.021
521	lb.	.019	.02
BRH 2	lb.	.0213	.0351
BRS 700	lb.	.02	.0285
BRT 7	lb.	.03	.031
BRV	lb.	.0475	.0565
Bunarex Liquid	lb.	.0425	.0555
Resins	lb.	.065	.1225
Bunnatol G, S	lb.	.40	.505
Butac	lb.	.125	.135
Butyl stearate, comml	lb.	.255	
Harchem	lb.	.2525	.3425
Binney & Smith	lb.	.23	.26
Ohio-Apex	lb.	.245	.255
G. P.	lb.	.0125	.02
R-100	lb.	.045	.0525
Butyl stearate—TT	lb.	$0.017	$0.02
Califlux G. P.	lb.	.015	.0225
R-100	lb.	.0475	.0575
T-T	lb.	.019	.0295
510, 550	lb.	.0275	.0375
Capryl alcohol, comml	lb.	.195	.235
Binney & Smith	lb.	.18	.28
Harchem	lb.	.195	.30
Chlorowax 40	lb.	.1625	.1825
70	lb.	.185	.245
-S	lb.	.21	.27
Circo light	gal.	.17	
Circosol-2XH	gal.	.185	
Contogums	lb.	.0875	.111
Cumar Resins	lb.	.065	.17
DBM (dibutyl-m-cresol)			
Darax	lb.	.32	.3475
DBP (dibutyl phthalate), comml	lb.	.30	.133
Darex	lb.	.30	.33
Eastman	lb.	.29	.335
Harflex 140	lb.	.30	.395
Harwick Std. Chem. Co.	lb.	.325	.385
Hatco	lb.	.30	.33
Monsanto	lb.	.30	.33
Naugatuck	lb.	.30	.33
Ohio-Apex	lb.	.30	.335
PX-104	lb.	.30	.33
Rubber Corp. of America	lb.	.30	.44
Sherwin-Williams	lb.	.30	.33
DBS (dibutylsebacate) comml	lb.	.66	.69
Eastman	lb.	.68	.71
Harflex 40	lb.	.655	.745
Hatco	lb.	.66	.685
Monoplex	lb.	.66	.675
Naugatuck	lb.	.665	.69
PX-404	lb.	.665	.69
DCP (dicaprylphthalate), comml	lb.	.295	.325
Harflex 180	lb.	.27	.36
Hatco	lb.	.295	.325
Monoplex	lb.	.30	.315
DDA (didecyladipate)			
Good-rite GP-236	lb.	.40	.55
DDP (didecylphthalate)			
Good-rite GP-266	lb.	.295	.45
Hatco	lb.	.305	.435
Defoamer X-3	lb.	.355	
DIBA (diisobutyladipate)			
Darex	lb.	.4325	.4625
Eastman	lb.	.41	.44
Ohio-Apex	lb.	.41	.445
DIDA (diisodecyladipate)			
Monsanto	lb.	.425	.455
RC	lb.	.40	.54
DIDP (diisodecylphthalate)			
Darex	lb.	.32	.35
Harchem	lb.	.29	.385
Monsanto	lb.	.305	.335
Ohio-Apex	lb.	.29	.325
PX-120	lb.	.305	.335
RC	lb.	.29	.43
Dielex B	lb.	.06	
Diethylene giycol, comml	lb.	.1525	.1825
Wyandotte	lb.	.15	.165
Dinopol IDO	lb.	.285	.32
DIOA (diisooctyladipate)			
Harflex 220	lb.	.40	.495
Naugatuck	lb.	.435	.465
PX-208	lb.	.425	.455
Rubber Corp. of America	lb.	.40	.54
DIOP (diisooctylphthalate), comml	lb.	.305	.335
Darex	lb.	.32	.35
Eastman	lb.	.305	.335
Harflex 120	lb.	.28	.375
Hatco	lb.	.305	.335
Monsanto	lb.	.305	.335
Naugatuck	lb.	.305	.335
Ohio-Apex	lb.	.28	.315
PX-108	lb.	.305	.335
Rubber Corp. of America	lb.	.28	.43
Sherwin-Williams	lb.	.32	.34
DIOS (diisooctylsebacate), comml	lb.	.61	.64
Rubber Corp. of America	lb.	.5925	.70
DIOZ (diisooctylazelate)			
Cabflex	lb.	.48	.51
Dipolymer Oil	gal.	.33	.38
Dispersing Oil No. 10	lb.	.06	.0625
DNODP (di-n-octyl-n-decyl phthalate), Monsanto	lb.	.345	.375
DOA (dioctyladipate), comml	lb.	.425	.455
Eastman	lb.	.40	.43
Good-rite GP-233	lb.	.40	.55
Harflex 250	lb.	.40	.495
Hatco	lb.	.435	.465
Monsanto	lb.	.425	.455
Naugatuck	lb.	.435	.465
PX-238	lb.	.425	.455
Rubber Corp. of America	lb.	.40	.54
DOP (dioctylphthalate), comml	lb.	.305	.335
Darex	lb.	.32	.35
Eastman	lb.	.28	.315
Good-rite GP-261	lb.	.285	.44
Harflex 150	lb.	.28	.375
Hatco	lb.	.305	.335
Monsanto	lb.	.305	.335
Naugatuck	lb.	.305	.335
Ohio-Apex	lb.	.28	.315
Polycizer 162	lb.	.28	.435
PX-138	lb.	.305	.335
Rubber Corp. of America	lb.	.28	.43
Sherwin-Williams	lb.	.305	.335
DOS (dioctylsebacate), comml		.61	.64
DOS Eastman	lb.	$0.61	$0.64
Harflex 50	lb.	.5925	.6825
Hatco	lb.	.61	.635
Monoplex	lb.	.61	.635
Naugatuck	lb.	.615	.64
PX-438	lb.	.615	.64
Rubber Corp. of America	lb.	.5925	.70
Drapex 3.2	lb.	.40	.54
Dutch Boy NL-A10 (DBP)	lb.	.30	.33
-A20 (DOP), A30 (DIOP)	lb.	.305	.335
-A54	lb.	.295	.325
-C20 (DOS)	lb.	.61	.63
-F21	lb.	.395	.425
-F31	lb.	.44	.47
-F41	lb.	.48	.51
Dutrex 6	lb.	.025	.035
Dymerex Resin	lb.	.135	.1475
Emulphor EL-719	lb.	.52	.73
Endor	lb.	.65	
Ethox	lb.	.43	.455
Ethylene glycol, comml	lb.	.135	.165
Wyandotte	lb.	.1325	.1425
Flexol 3 GH	lb.	.44	.46
3 GO	lb.	.53	.55
4 GO	lb.	.325	.355
10-A	lb.	.425	.455
426	lb.	.27	.30
810, 810X, 10-10, 10-10X	lb.	.305	.335
TOF, A-26	lb.	.435	.465
Flexricin P-4	lb.	.3475	.3625
P-6	lb.	.415	.43
P-8	lb.	.3475	.3625
PG-16	lb.	.335	.35
Fortex	lb.	.125	.145
G. B. Asphaltic Flux	gal.	.097	.177
Naphthenic Neutrals	gal.	.125	.215
Process oil, light	lb.	.0275	.0375
Medium	lb.	.0375	.0475
Galex W-100	lb.	.155	.18
W-100 D	lb.	.1525	.1775
Gilsowax B	lb.	.0975	.11
Harchemex	lb.	.24	.345
Harflex 300	lb.	.58	.675
325	lb.	.4325	.52
375	lb.	.7425	.83
500	lb.	.315	.41
HB-20	lb.	.15	.17
-40	lb.	.19	.21
Heavy Resin Oil	lb.	.0225	.0375
HSC-13	lb.	.25	.32
-39	lb.	.22	.29
Hycar 1312	lb.	.60	
Indonex	gal.	.13	.225
Kapsol	lb.	.33	.355
Kenflex A, L	lb.	.26	.27
B	lb.	.23	.24
N	lb.	.18	.19
Kessoflex 103	lb.	.405	
105	lb.	.3325	
106	lb.	.38	
107	lb.	.525	
110	lb.	.24	
111	lb.	.28	
KP-23	lb.	.315	.325
-90	lb.	.40	.435
-140	lb.	.46	.485
-201	lb.	.58	.59
-220	lb.	.33	.365
-555	lb.	.59	.60
Kronisol	lb.	.33	.365
Kronitex AA, I, K-3, Mx	lb.	.325	.36
LX-685, -125, -135	lb.	.125	.135
Marvinol plasticizers	lb.	.28	.8825
Methox	lb.	.385	.41
Monoplex S-38	lb.	.215	.24
S-71	lb.	.45	.475
Morflex	lb.	.25	.65
Natac	lb.	.12	.13
Neoprene Peptizer P-12	lb.	1.05	
Nevillac	lb.	.31	.85
Neville R Resins	lb.	.145	.205
Nevinol	lb.	.24	
No. 1-D heavy oil	lb.	.065	
NP-10	lb.	.50	.53
ODA (octyldecyladipate)			
Good-rite GP-235	lb.	.40	.55
RC	lb.	.40	.54
ODP (octyldecylphthalate)			
Good-rite GP-265	lb.	.29	.445
Hatco	lb.	.305	.335
Rubber Corp. of America	lb.	.285	.43
Ohopex Q-10	lb.	.28	.315
R-9	lb.	.3525	.3775
Orthonitro benzophenol, comml	lb.	.13	.15
Monsanto	lb.	.13	.15
Palmalene	lb.	.15	
Panaflex BN-1	lb.	.185	.225
Panarez Resins	lb.	.09	.14
Para Flux, regular	gal.	.10	.2125
No. 2016	gal.	.165	.24
2332	gal.	.11	
4205	lb.	.1075	.2125
Para Lube	lb.	.046	.048
Resins	lb.	.04	.045
Paradene Resins	lb.	.07	.08
Paraplex 5-B	lb.	.29	.3475
Al-111	lb.	.32	.3275
G-25	lb.	.76	.77
-40	lb.	.4825	.51
-50	lb.	.39	.4175
-53	lb.	.4325	.46
-60	lb.	.325	.35
-62	lb.	.345	.37
RG-7	lb.	.33	.335
-8	lb.	.505	.5125
-10	lb.	.52	.5275
Peptizer 620	lb.	.37	
640	lb.	.42	

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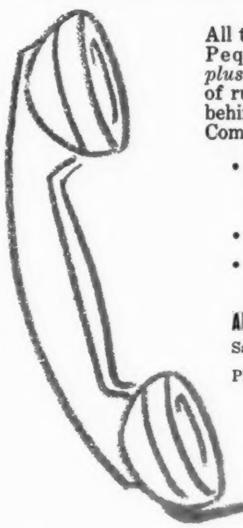

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(Z-3)	lb.	.07 /	.085
(Z-6)	lb.	.08 /	.095
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Piccolastic Resins	lb.	.16 /	.25
Piccolyte Resins	lb.	.205 /	.245
Piccopale Resins	lb.	.12 /	.135
Piccovars	lb.	.165 /	.20
Piccovol	lb.	.025 /	.038
Pictar	gal.	.25 /	.30
Pigmentar	lb.	.046 /	.0634
Pigmentaroil	lb.	.046 /	.0634
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Plasticizers			
42	lb.	.34 /	.40
84	lb.	.27 /	.305
B	lb.	.35 /	.45
DP-520	lb.	.435 /	.455
MP	lb.	.035 /	.0755
MT-511	lb.	.6925/	.7425
ODN	lb.	.35 /	.475
SC	lb.	.40 /	.515
Plastoflex #3	lb.	.52 /	.57
#520	lb.	.36 /	.435
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MGB	lb.	.29 /	.37
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Polycizers	lb.	.28 /	.55
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D	lb.	.225 /	.235
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DX, C-130	lb.	.1375/	.1475
Poly-Sperse AP-2	lb.	.23 /	.295
AP-300	lb.	.26 /	.325
LC-20	lb.	.26 /	.325
R-100	lb.	.17 /	.325
PT Pine Tars	lb.	.038 /	.0554
Reogen	lb.	.1425/	.145
101 Pine Tar Oil	lb.	.038 /	.0554
Resin C pitch	lb.	.0225/	.031
R6-3	lb.	.38 /	.40
Resinex 10, 25, 50, 110	lb.	.04 /	.045
70	lb.	.0325/	.0375
85, 100	lb.	.035 /	.04
115	lb.	.0375/	.0425
L-2, L-3, L-4, L-5	lb.	.0225/	.03
Rosin Oil, Sunny South	gal.	.58 /	.76
RPA No. 2	lb.	.82	
3	lb.	.48	
Conc.	lb.	.85	
5	lb.	.68	
6	lb.	1.62	
RSN Flux	gal.	.10 /	.91
Rubber Oil B-5	lb.	.0225/	.0355
Rubberol	lb.	.18 /	.2725
Santicizer 1-H	lb.	.50 /	.51
3	lb.	.46 /	.47
8	lb.	.43 /	.44
9	lb.	.39 /	.42
140	lb.	.325 /	.36
141	lb.	.34 /	.37
160	lb.	.25 /	.28
601	lb.	.325	
602	lb.	.305	
B-16	lb.	.4875/	.4975
E-15	lb.	.5075/	.5375
Santocizer	lb.	.4275/	.4575
Sebacic acid, purified, comml.	lb.	.59 /	.65
Binney & Smith	lb.	.64 /	.76
C. P.- Binney & Smith	lb.	.72 /	.84
Harchem	lb.	.69 /	.89
Sherolatum Petroleum	lb.	.05 /	.10
Softener #20	gal.	.10 /	.20
Special Rubber Resin 100	lb.	.1675/	.2175
Staflex AX	lb.	.43	
DBES	lb.	.61 /	.635
Syn-Tac	gal.	.33 /	.35
Synthol	lb.	.17 /	.2625
Thiokol TP-90B	lb.	.59	
-95	lb.	.65	
Triacetin	lb.	.365 /	.40
Tributyl phosphate	lb.	.50 /	.535
Tributyrin	lb.	.69	
Tricresyl phosphate, comml	lb.	.33 /	.36
Monsanto	lb.	.325 /	.36
Naugatuck	lb.	.33 /	.36
PX-917	lb.	.33 /	.36
Triphenyl phosphate, comml	lb.	.39 /	.40
Monsanto	lb.	.39 /	.40
Turgum S	lb.	.1075/	.1175
Tysonite	lb.	.3025/	.305
United	gal.	.69 /	1.20
X-1 Resinous Oil	lb.	.0225/	.0325

Reclaiming Oils

Acintol C, P	lb.	.02 /	.03
Bardol, 639	lb.	.0275/	.0375
B	lb.	.0625/	.065
BRH 2	lb.	.0213/	.0351
BRT 3	lb.	.018 /	.0265
4	lb.	.025 /	.026
7	lb.	.03 /	.031
BRV	lb.	.0475/	.0565
Burco-RA	lb.	$0.053 /	$0.0805
BWH-1	lb.	.16 /	.18
Dipolymer Oil	gal.	.33 /	.43
Dispersing Oil No. 10	lb.	.06 /	.0625
G. B. Oils	gal.	.115 /	.275
Heavy Resin Oil	lb.	.0225/	.0375
LX-572	gal.	.27 /	.32
-759	gal.	.1375	
-777, -809, -859	gal.	.23 /	.33
-869	gal.	.33 /	.43
-871	gal.	.34 /	.44
No. 3186	gal.	.28 /	.295
Picco 6535	gal.	.25 /	.30
C-33	gal.	.215 /	.315
-42	gal.	.23 /	.33
D-4	gal.	.27 /	.37
E-5	gal.	.25 /	.35
Q-Oil	gal.	.286 /	.36
PT 101 Pine Tar Oil	lb.	.038 /	.0554
Reclaiming Oil #3186	gal.	.28 /	.385
-G	gal.	.25 /	.365
4039-M	gal.	.3275/	.3975
-Y	gal.	.30 /	.37
RR-10	lb.	.37	
S. R. O.	lb.	.015 /	.0225
X-1 Resinous Oil	lb.	.0225/	.0325

Reinforcers, Other Than Carbon Black

Angelo Shellacs	lb.	.485 /	.7325
Borden, Chem. Div.			
Arcco 978-42B	lb.	.18 /	.19
1073-18B	lb.	.135 /	.145
1294-36B	lb.	.115 /	.125
1301-12B	lb.	.15 /	.16
BRC 20	lb.	.15 /	.175
22	lb.	.025 /	.0275
30	lb.	.0125/	.021
521	lb.	.019 /	.02
Bunarex Resins	lb.	.065 /	.1225
Cab-o-sil	lb.	.67 /	.85
Calcene NC	ton	80.00 /	100.00
TM	ton	82.50 /	102.50
Calco S. A.	lb.	.85 /	.88
Clays			
Aiken	ton	14.00	
Aluminum Flake	ton	22.25 /	60.00
Buca	ton	45.00	
Burgess Iceberg	ton	50.00 /	80.00
Icecap K	ton	65.00 /	90.00
Pigment #20	ton	35.00 /	60.00
#30	ton	37.00 /	60.00
Catalpo	ton	35.00	
Crown	ton	14.00 /	33.00
Dixie	ton	14.50	
Franklin	ton	13.50 /	35.25
L. G. B.	ton	17.00	
McNamee	ton	14.50	
Par	ton	15.00	
Paragon	ton	13.50 /	33.00
Pigment No. 33	ton	37.00	
Recco	ton	14.00	
Suprex	ton	14.00 /	33.50
Swanee	ton	12.50	
Whitetex	ton	50.00	
Windsor	ton	14.00 /	30.00
Witco No. 1	ton	14.00 /	30.00
No. 2	ton	13.50 /	30.00
Clearcarb	lb.	.1175/	.1255
Cumar Resins	lb.	.065 /	.17
Darex Resins	lb.	.42 /	.49
DC Silica	lb.	1.15 /	1.40
Diatomaceous silica	ton	32.00 /	48.00
Good-rite 2007		.36 /	.38
2057		.30 /	.31
K Series Polymers	lb.	.15 /	.37
233	lb.	.08 /	.095
X303	lb.	.40 /	.45
Hycar 2001	lb.	.55	
2007	lb.	.39	
Indulins	lb.	.06 /	.08
Kralac A-EP	lb.	.43 /	.54
Laminar	ton	30.00	
Magnesium carbonate, Marinco CL	lb.	.105 /	.135
Marbon Resins	lb.	.36 /	.43
Multifex MM	ton	117.50 /	137.50
Super	ton	167.50 /	187.50
Neville Resins			
465	lb.	.075 /	.08
LX-509	lb.	.33 /	.35
Nebony	lb.	.045 /	.05
Paradene	lb.	.07 /	.08
R	lb.	.145 /	.205
Para Resins 2457	lb.	.04 /	.045
Parapol S-Polymers	lb.	.44	
Picco Resins	lb.	.1275/	.22
Piccolyte Resins	lb.	.205 /	.275
Piccoumaron Resins	lb.	.07 /	.19
Piccovars	lb.	.145 /	.20
Pliolite NR types	lb.	.98 /	1.33
S-3	lb.	.42 /	.49
S-6	lb.	.36 /	.43
-6B	lb.	.36 /	.43
Plio-Tuf G85C	lb.	.52 /	.59
Purecal M	ton	56.75 /	71.75
SC, T	ton	110.00 /	125.00
U	ton	120.00 /	135.00
R-B-H 510	lb.	.15 /	.22
Resinex	lb.	.0375/	.0525
Rubber Resin LM-4	lb.	.28 /	.35
Silene EF	ton	120.00 /	140.00
Silvacons	ton	55.00 /	85.00
Transphalt	lb.	.0375/	.0525
Witcarb P	ton	117.50 /	153.50
R	ton	127.50 /	163.50
Regular	ton	60.00 /	96.00
Zeolex 23	lb.	.055 /	.06
Zinc oxide, commercial†	lb.	.135 /	.1775

Retarders

Benzoic acid TBAO-2	lb.	$0.44	
E-S-E-N	lb.	.37 /	$0.39
Good-rite Vultrol	lb.	.62 /	.66
R-17 Resin	lb.	.1075/	.36
Retarder ASA	lb.	.57	
J	lb.	.68 /	.73
PD	lb.	.39 /	.41
W	lb.	.42	
Retardex	lb.	.47 /	.50
Thionex	lb.	1.14	
Wiltrol P	lb.	.39 /	.41

Solvents

Bondogen	lb.	.555 /	.605
Butyrolactone	lb.	.60 /	.65
Cosol #1	gal.	.37 /	.43
#2	gal.	.42 /	.48
Dichloro Pentanes	lb.	.04 /	.07
Dipentene DD, Sunny South	gal.	.42 /	.63
Ethylene dichloride, comml.	lb.	.09 /	.122
Hi-Flash 2-50-W	gal.	.41	
Pale yellow	gal.	.39	
LX-572	gal.	.27 /	.32
-748	gal.	.16 /	.23
Methyl-2-pyrrolidone	lb.	.75 /	.80
Neville Nos. 100, 104	gal.	.52 /	.60
106	gal.	.38 /	.46
Nevsolv H, 200	gal.	.19 /	.29
HF, T, 30	gal.	.24 /	.34
Penetrell	gal.	.42 /	.63
Picco Hi-Solv Solvents	gal.	.16 /	.48
Pine Oil DD, Sunny South	lb.	.15	
Skellysolve-B	gal.	.17	
-H	gal.	.148	
-R, -V	gal.	.139	
-C	gal.	.162	
Stauffer Carbon Disulfide	lb.	.0525/	.085
Tetrachloride	lb.	.0825/	.475

Tackifiers

Acintol R	lb.	.065 /	.07
Bardol, 639	lb.	.0275/	.0375
Borden, Arcco			
A25, A26, 716-30	lb.	.18 /	.19
555-40R	lb.	.185 /	.205
620-32B	lb.	.20 /	.21
716-35	lb.	.17 /	.18
1041-21	lb.	.165 /	.175
BRH 2	lb.	.0213/	.0351
Bunarex Resins	lb.	.065 /	.1225
Chlorowax 70	lb.	.18 /	.24
Contogums	lb.	.0875/	.11
Cumar Resins	lb.	.065 /	.17
Galex W-100	lb.	.155 /	.17
W-100D	lb.	.1525/	.1625
Indopol H-35	gal.	.65 /	.84
H-50	gal.	.70 /	.89
-100	gal.	.85 /	1.08
-300	gal.	1.00 /	1.24
-1500	gal.	1.48	
L-10	gal.	.40 /	.59
-50	gal.	.45 /	.64
-100	gal.	.55 /	.74
Kenflex resins	lb.	.18 /	.27
Koresin	lb.	.90 /	1.10
Natac	lb.	.12 /	.13
Nevindene	lb.	.15 /	.18
Picco Resins	lb.	.1275/	.22
Piccolastic Resins	lb.	.1855/	.34
Piccolyte Resins	lb.	.185 /	.25
Piccopale Resins	lb.	.089 /	.13
Piccoumaron Resins	lb.	.07 /	.185
R-B-H 510	lb.	.15 /	.22
Roelflex 1118A	lb.	.39	
Synthetic 100	lb.	.41	
Synthol	lb.	.17 /	.2625
United	gal.	.69 /	1.20

Vulcanizing Agents

Dibenzo G-M-F	lb.	2.60	
G-M-F #113, #117	lb.	.90	
HMDA-Carbamate	lb.	4.50 /	4.90
Ko-Blend I, S	lb.	.39	
Litharge (*See Accelerator-Activators, Inorganic*)			
Magnesium oxide	lb.	.2525/	.38
Maglite D, K	lb.	.235 /	.305
M	lb.	.2675/	.33
Marmag	lb.	.2225/	.2725
PSD 85	lb.	.37 /	.50
Red Lead (*See Accelerator-Activators, Inorganic*)			
Sulfasan R	lb.	1.55 /	1.57
Sulfur flour, comml.	100 lbs.	2.55 /	3.30
1018	lb.	.12 /	.1575
Aero	100 lbs.	2.40 /	7.75
Crystex	lb.	.195 /	.23
Insoluble 60	lb.	.125 /	.13
Rubbermakers	100 lbs.	2.65 /	4.55
Stauffer	lb.	.0265/	.054
Telloy	lb.	2.75	
VA-7	lb.	.50 /	.60
Vandex	lb.	7.50	
Vultac No. 2	lb.	.47 /	.74
3	lb.	.51 /	.78
White lead silicate (*See Accelerator-Activators, Inorganic*)			

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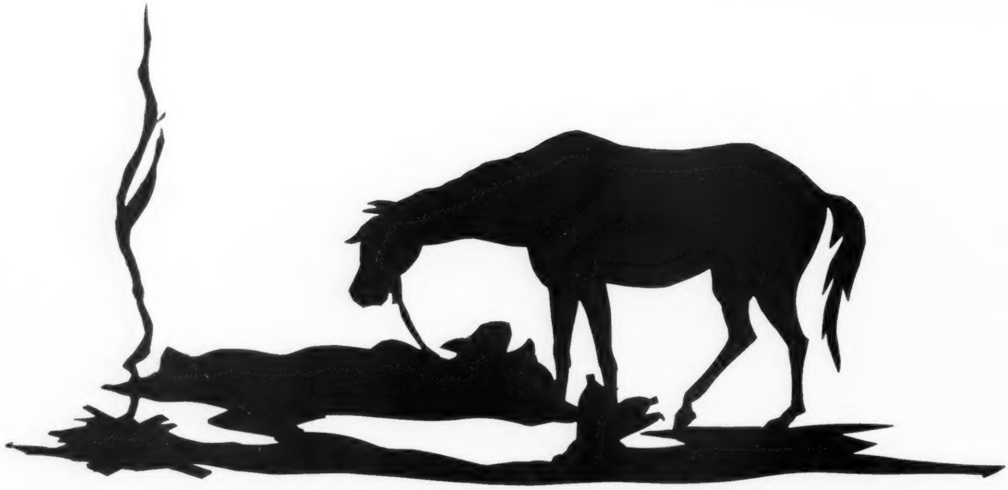

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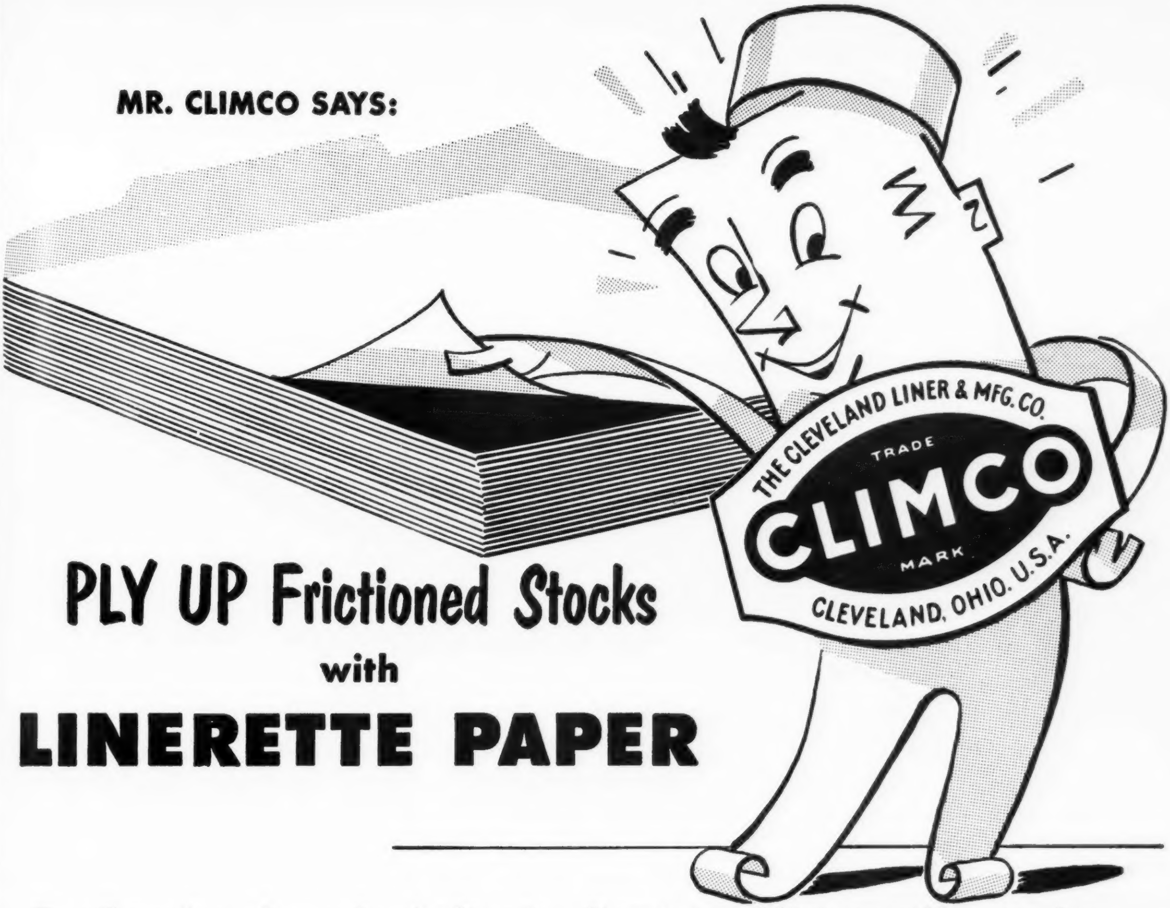

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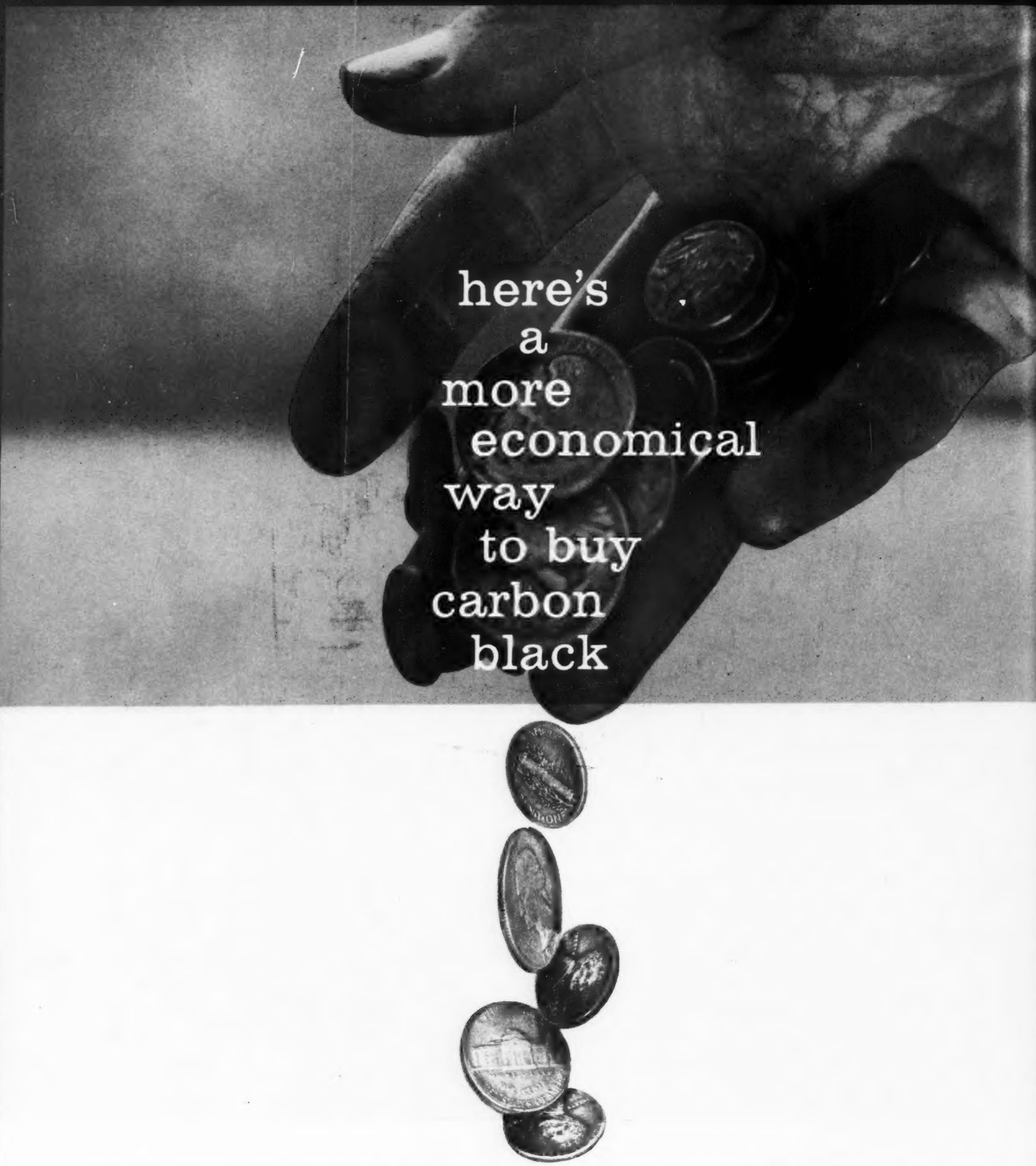

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